621.32

Improved Interchangeable Arc Lamps

7010

August 1902

Western Electric Company

Chicago St. Louis Philadelphia New York

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API INTERNATIONAL

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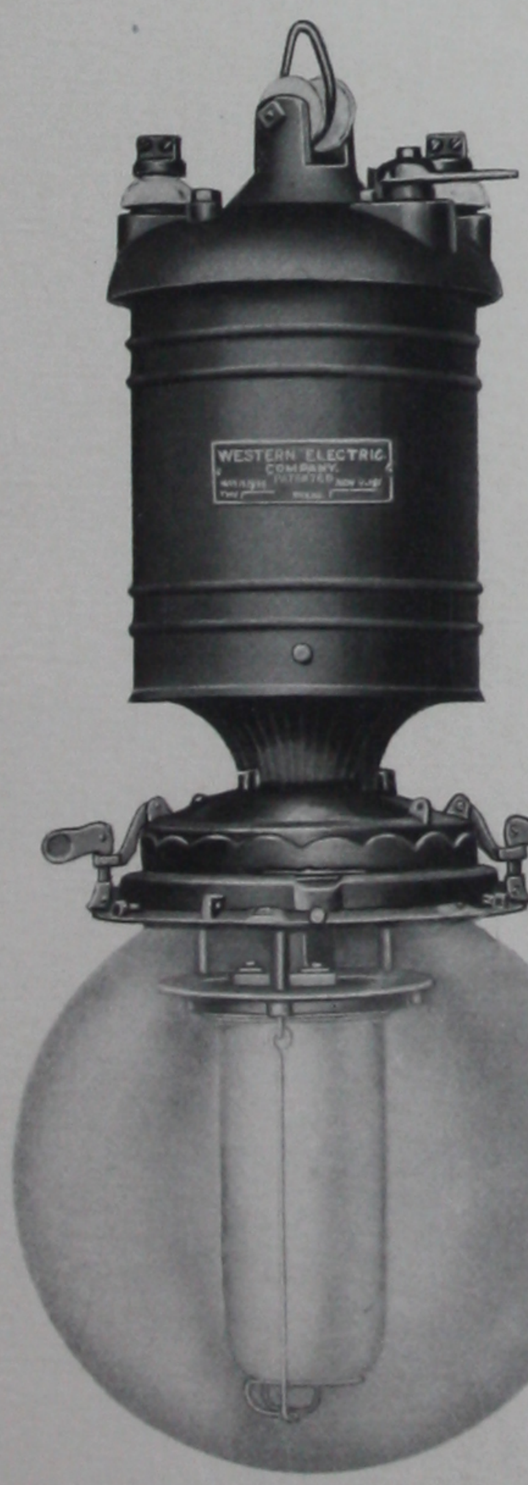
Western Electric Company

MULTIPLE SERIES AND CONSTANT CURRENT ARC LAMPS FOR DIRECT CURRENT CIRCUITS

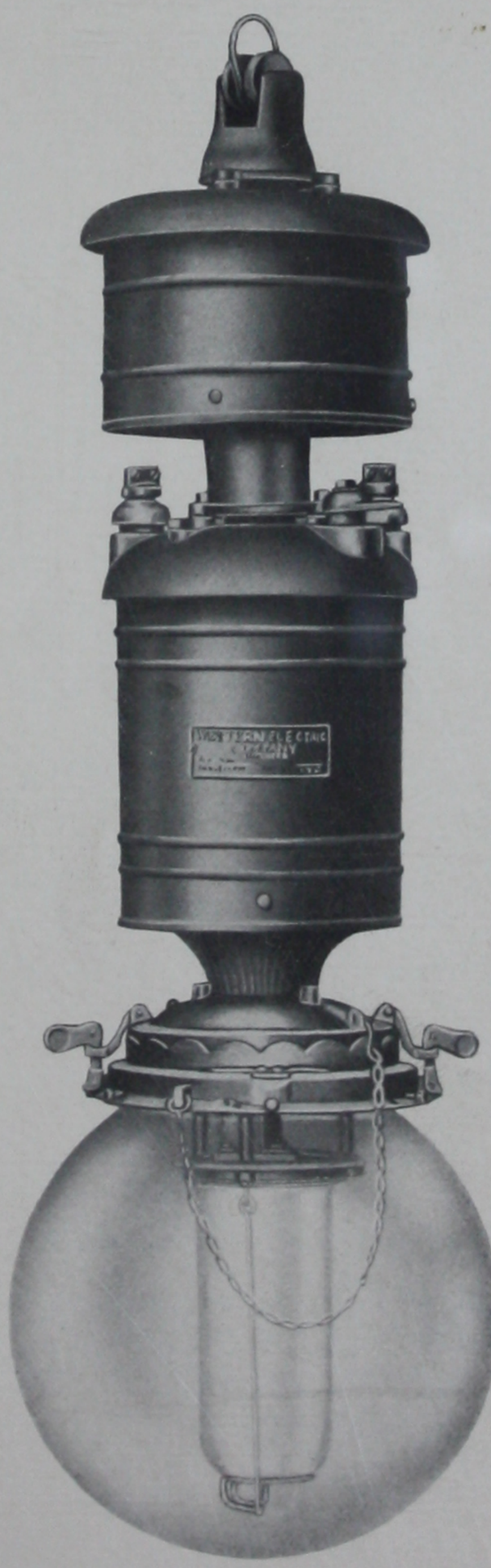
Bulletin 7030 -35 - 7010 December, 1904



Type 420.



Type 414.



Type 425.

Multiple Series and Constant Current Arc Lamps for Direct Current Circuits

Introductory

FOR the operation of arc lamps in multiple series on 220 volt and 500 volt direct-current circuits, as well as on constant-current series circuits, it is necessary to provide an arc lamp in which not only the voltage of the arc but also the current through the arc is controlled. If the voltage alone is taken care of by the regulating mechanism of the lamp, a slight change in terminal pressure will result in a considerable increase in current in the arc. If the current in the arc alone is controlled, the arc voltage is likely to vary, causing one lamp to run at a higher or lower voltage than the lamp in series with it, and resulting in an uneven illumination. In order to overcome these troubles, we provide a lamp in which the main magnet is connected in series with the arc and the shunt magnet across the arc. The relative action of these magnets is such that should the current increase, the voltage of the arc will increase proportionately, or should the voltage decrease the current will decrease proportionately. The mechanism, therefore, maintains current and arc voltage at proportional values, resulting in stable conditions and uniformity in illuminating power of the different lamps in series.

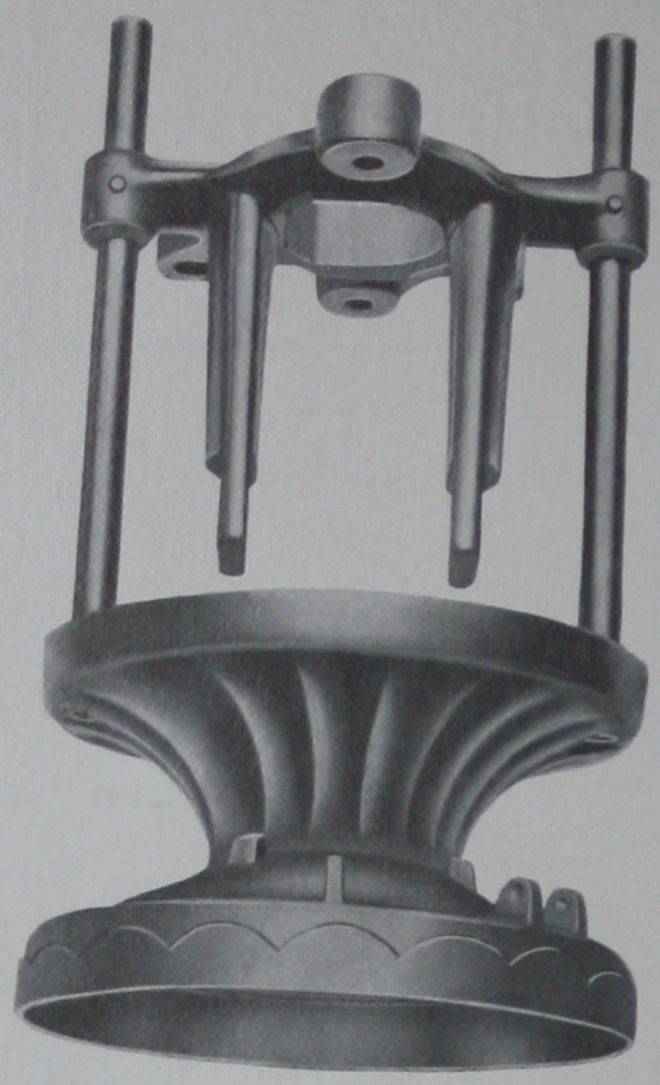


Fig. 1.
Framework of lamp.

are supported and thus simplify and cheapen the lamp. The exciting coils, both on the shunt and series sides (Fig. 2), are so attached to the supports as to be readily accessible for inspection or removal. A single screw is all that need be taken out to remove a coil.

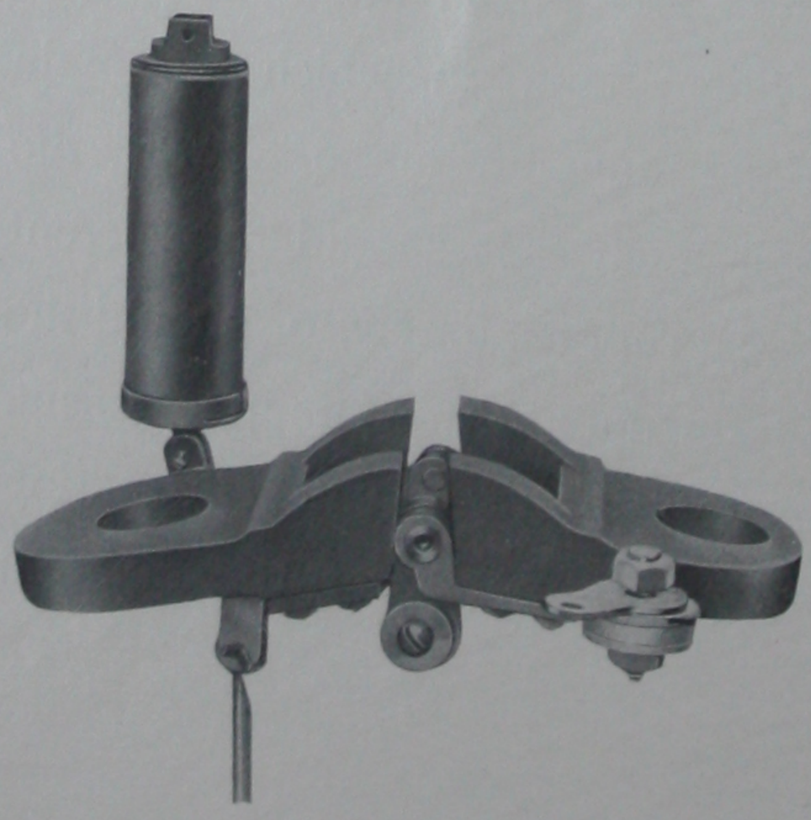


Fig. 3.
Adjustable shunt and series armature with cut-out and lifting link.

Operation

The arrangement of parts results in an action of the shunt magnet in opposition to that of the series magnet and, by a proper proportioning and shaping of the paraboloid pole-tips upon the magnet cores, we have succeeded in so balancing the two magnets, one against the other, as to secure a very accurate and reliable adjustment of the arc voltage, together with a positive reliable cut-out action at a moderate increase of voltage above normal.

But a single exciting coil is used on each of the electro-magnets and the magnetic circuits are combined in one throughout a portion of their length, enabling us to utilize a portion of the mechanical framework (Fig. 1) upon which the exciting coils

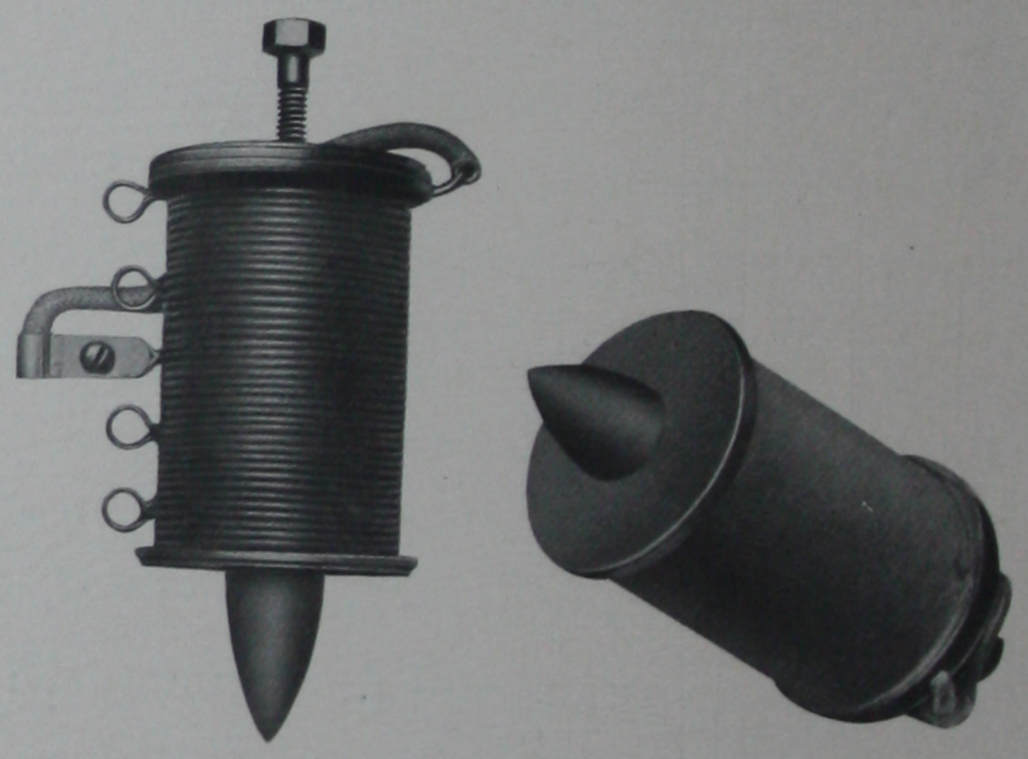


Fig. 2.
Series and shunt coils.

The armature (Fig. 3) is directly connected by a link to the carbon lifting clutch, the link being so formed that a slight bending in one direction or the other will adjust it for length and thus permit the pick-up or starting point of the lamp to be adjusted. The armature itself is in two portions, pivotally connected for the purpose of facilitating adjustment of the relative position of the two portions, with one another and with the paraboloid core tips. The windings of the

exciting coils, while generous and sufficient for the work to be performed and giving ample radiating surface, are considerably smaller in bulk and require a smaller expenditure of energy than is the case in lamps where two coils are used for each magnetic circuit. For this reason the efficiency of the lamp is very high under all normal conditions of operation.

The automatic cut-out has one part mounted directly upon the moving armature, the other part being mounted upon the framework of the lamp but well insulated therefrom. The contact surfaces are provided with silver contact pieces. This cut-out is so arranged that when the lamp is not in operation it stands closed and when through any abnormal conditions in the lamp, say, a failure of the carbon to feed down or sticking of the mechanism, the device will automatically cut out the lamp.

A feature common to all our lamps and one that has attracted widespread attention is a peculiarly shaped body, known as the waist (Fig. 4). Its function is to separate the operating mechanism from the arc. It insures low temperature of the operating parts, the heat of the arc being confined to its own chamber and dissipated by the radiating surface of the waist before it can reach the mechanism chamber. The waist is closed by an annular casting which prevents the heated air rising and carrying dust into the mechanism chamber. This feature has been found of great importance especially where arc lamps are operated in hot, dusty places and in cases where the outer globe is dispensed with.

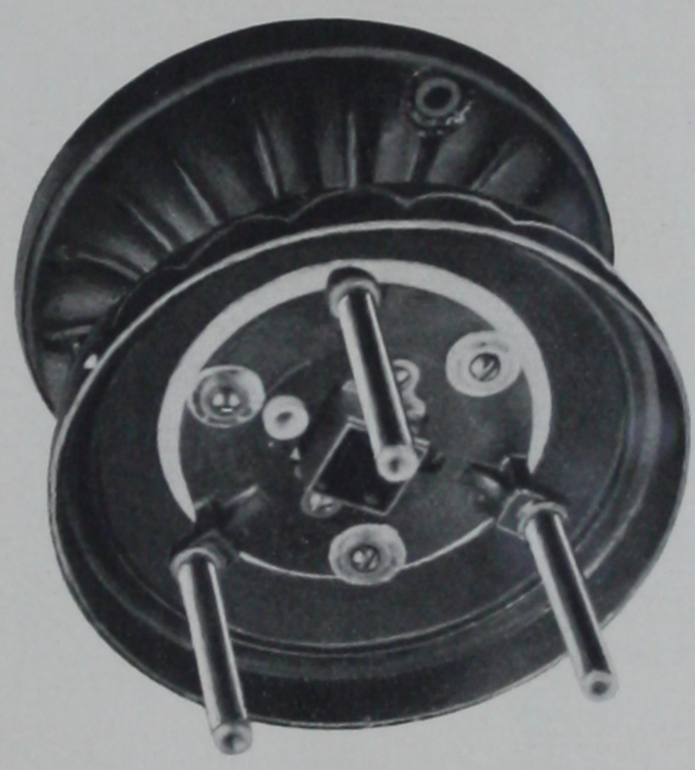


Fig. 4.
Waist, showing supporting studs for gas check plate.

Rigidity

The waist is so designed that it insures the mechanical rigidity of the lamp and preserves the relative adjustment of the parts. Unlike certain other manufacturers we do not depend, for the support of the movement in our lamp, upon a single tube placed in the center of the lamp. As will be seen in Fig. 4, the center tube in our lamp is secured to the bottom of the waist by means of two screws and is guided into position at the top, while the two brass tubes on the outside form parts of a supporting frame to which the operating parts are attached. This construction removes one prolific source of trouble in arc lamp operation, *i. e.*, the getting out of alignment of the operating parts. With accurately machined surfaces on the waist and a systematic jigging and drilling of all parts, the chances

for imperfect alignment and consequent sticking of the carbons are very remote. No shims, liners or other makeshift contrivances are needed when assembling our lamp.

The principal advantage arising from the use of the waist lies in the ability to put the lamp into the customer's hands in such a condition that no readjustment of parts will be found necessary.



Fig. 5.
Outer globe-holding ring.

In many arc lamps the outer globe is suspended in such a way that a strain is brought to bear upon the glass and the result is the frequent breakage of outer globes. Our outer globe-holding ring (Fig. 5), effectually overcomes this trouble and diminishes the cost of renewals of outer globes.

The square tube (Fig. 6) which forms the guide for the upper carbon, limits the travel of the movement of the carbon-holder and protects the copper ribbon from injury. This copper ribbon forms a flexible connection between the traveling carbon-holder and the stationary tube. It possesses the advantage over a spiral coil that it is not easily kinked or thrown out of order and offers a non-inductive path for the current; at the same time the attachment is so made to the square tube and carbon holder that no strain is brought to bear at its ends. We have in this copper ribbon a device tried by many years of service, and find it to exceed in reliability and durability any known form of spiral coil or flexible cord.



Fig. 7.
Upper carbon holder.



Fig. 6.
Square tube with folding ribbon.

The upper carbon-holder, (Fig. 7) to which the ribbon is attached, is made in a substantial manner of spring phosphor bronze punchings, so disposed that they will firmly grasp carbons of the ordinary commercial range in diameter, and possessed of sufficient stability and weight to overcome the slight frictional resistance which the carbon may meet. When the ordinary cheap form of spring tube is used for the upper carbon-holder, it is often found that the carbons become loosened, and the springs becoming hot lose their tension after a comparatively short time of service.

The clutch (Fig. 8) in our arc lamp is of the double ring type, plain and simple, without intricate parts, easily accessible, and adapted for commercial carbons. It effectually prevents the jarring through of the carbon.



Fig. 8.
Clutch.

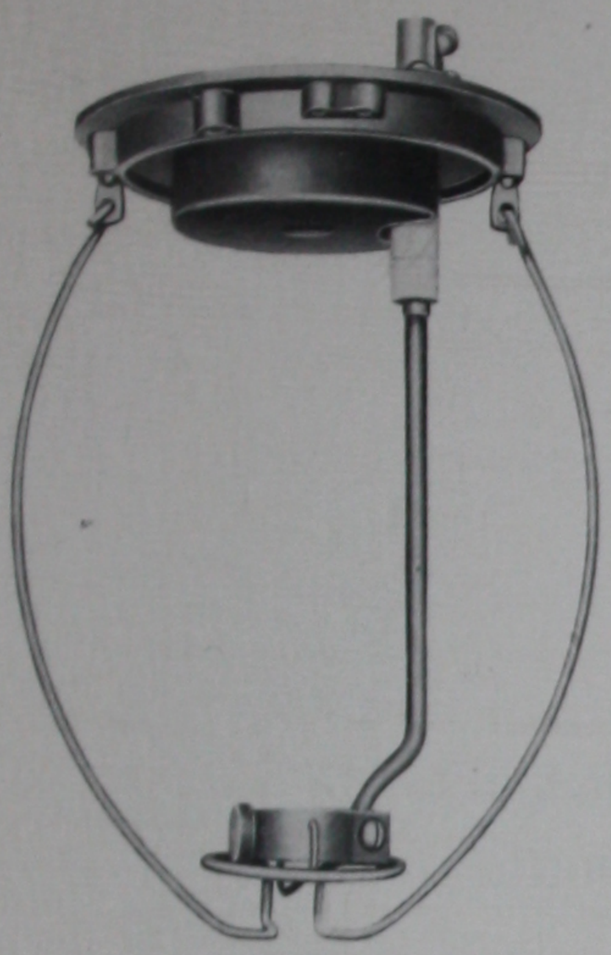


Fig. 9.
Gas check plate and bail support for inner globe.

The gas check plate (Fig. 9) is made of cast brass, hence is not subject to the rusting always found on cast iron plates.

The double gas check mounted upon the lower surface of the gas check plate is so formed as to retard the escape of the gases and restrict the admission of air, thus insuring long life in the carbons and high economy. The inner globe is supported by a bail (Fig. 9) which is pivotally attached to the gas check plate at its two extremities and is pressed into position by the spring portion of the bail resting against the lower extremity of the globe.

The Unit Resistance Drum Rheostat

The rheostat is built up of a number of vertical drums wound with high resistance wire (Fig. 10). The drums are all alike and readily interchangeable. They are supported on vertical steel rods and can easily be removed. The drums are made of well vitrified porcelain and provided with circular grooves in which the wire is imbedded. This construction prevents the wire from sagging and short-circuiting adjacent turns. As the wire is in close proximity with the porcelain, the heat is rapidly carried off by the drum.

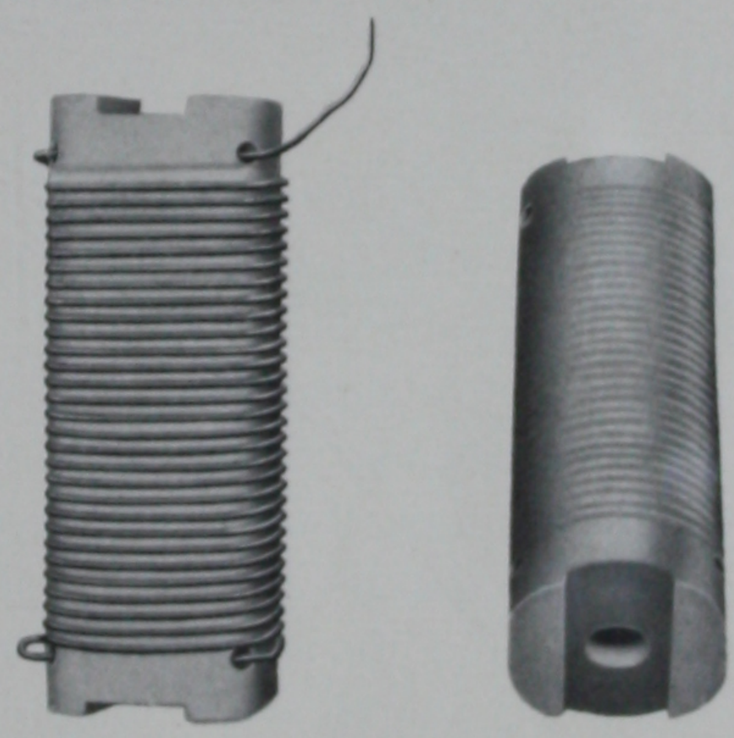


Fig. 10.
Unit resistance drums.

The drums are indestructible, as they will not crack or warp, and can carry 15 to 20 amperes for an indefinite length of time. If the arc should get short-circuited the rheostat will not be destroyed. By means of a clamp sliding up or down on the porcelain drum the active number of turns of wire are readily adjustable.



Fig. 11.
Enclosing Shell.

The Enclosing Shell

The shell (Fig. 11) for enclosing the movement of our lamp is made with a view to durability. Where other makers have recourse to spun rings and other perishable contrivances for providing the necessary radiating surface, we provide a plain cylindrical shell which can be relied upon to last for many years even in the most exposed places.

Replacing Open Series Arc Lamps with Enclosed Series Arc Lamps Operating at 9.6 Amperes

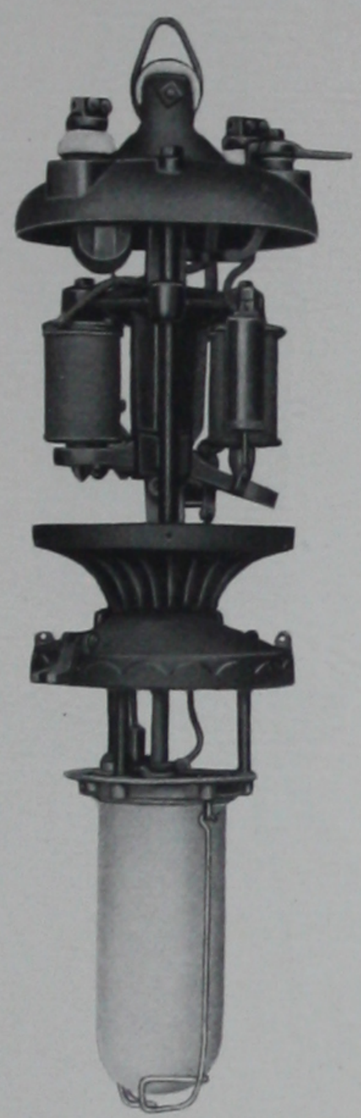
In many plants the open series arc lamps have been replaced by enclosed series arc lamps, and are being operated from the old arc machines. As these machines are wound for a current of 8 to 10 amperes, the lamps are adjusted for the lowest permissible voltage that will insure steady light. Owing to its simplicity, the Type 414 lamp has been extensively adopted for this work. The light is as evenly distributed as from the low amperage enclosed arc lamp, but its intensity is proportionally much larger, as the tips of the carbons assume a very high temperature and contribute to the light of the arc proper. In places where the atmosphere is laden with smoke, such as blacksmith shops, foundries and roundhouses, the greater penetrating power of the light is of great value. Users of this type of lamp consider it superior to any other form of illuminant for the purpose described.

When used for street lighting, the high amperage lamps may be placed farther apart than low amperage lamps, thereby compensating for the greater watt consumption of the lamp.

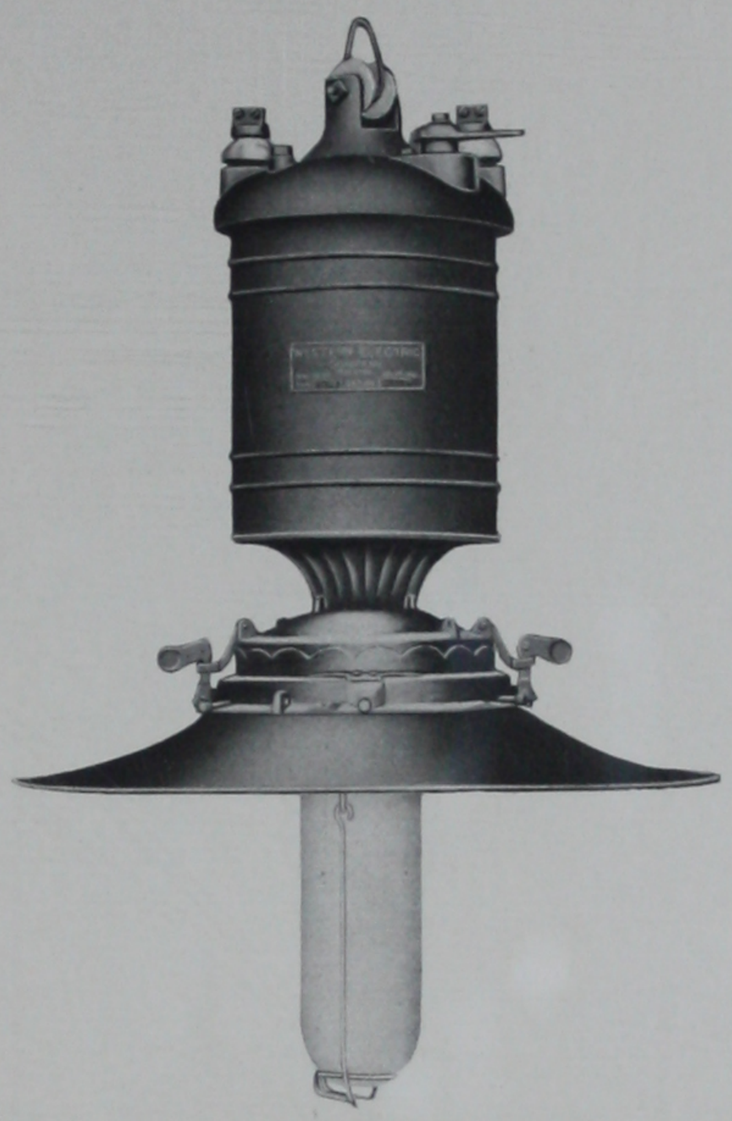
Arc Lamp, Type 414



Type 414 lamp equipped with outer globe "**S**" for street lighting.



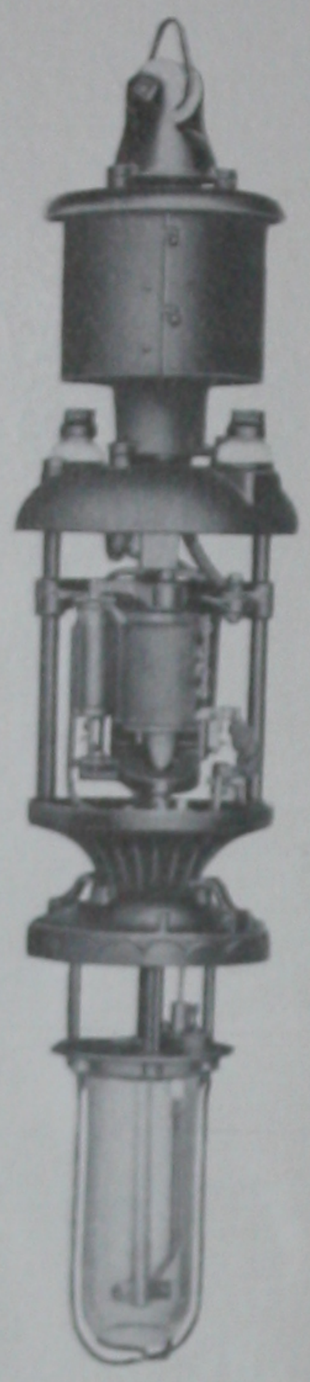
Side view of movements of lamp, showing magnets, dash pot and cut-out resistance.



Type 414 lamp equipped with metal shade for factory use.

This lamp is designed to operate in series on constant current arc machines. It can be wound for any current from 4 to 9.6 amperes. The standard lamp is adjusted for 7 amperes and 72 volts at the arc. The regulating mechanism of this lamp is the same as the one described for Type 425 arc lamp. The hand switch short-circuits the arc lamp. The automatic cut-out inserts between the positive and negative binding posts a resistance which causes the lamp to establish an arc when current is turned on. The resistance is not in circuit during the normal operation of the lamp. The lamp stands cut out when not in operation. The lamp can be provided with a metal shade for street lighting. The shade is 18 inches in diameter, fire enameled inside and outside, and is attached to the ring which carries the outer globe.

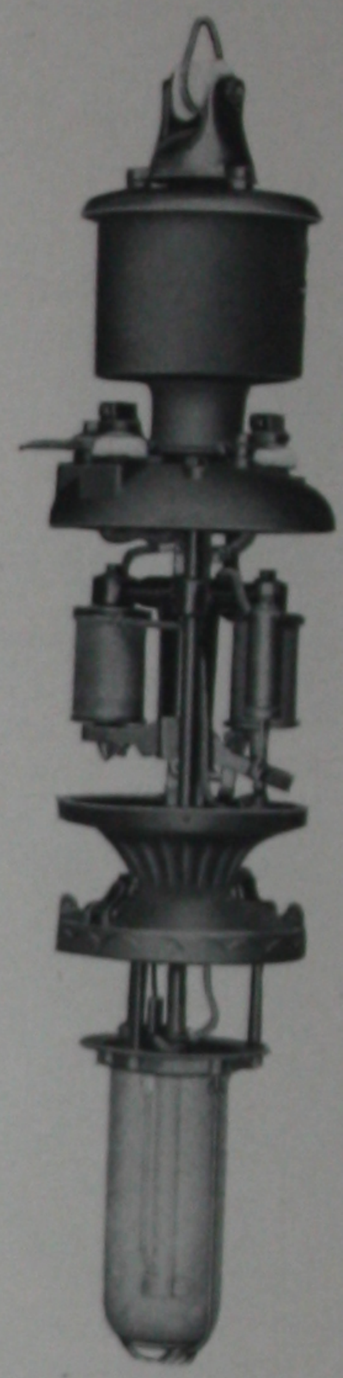
Arc Lamp, Type 420



Front view of lamp, showing adjustment for series magnet and dash pot.



Type 420 lamp showing accessibility of rheostat without disturbing any other parts of the lamp.



Side view of lamp, showing series and shunt magnets and dash pot.

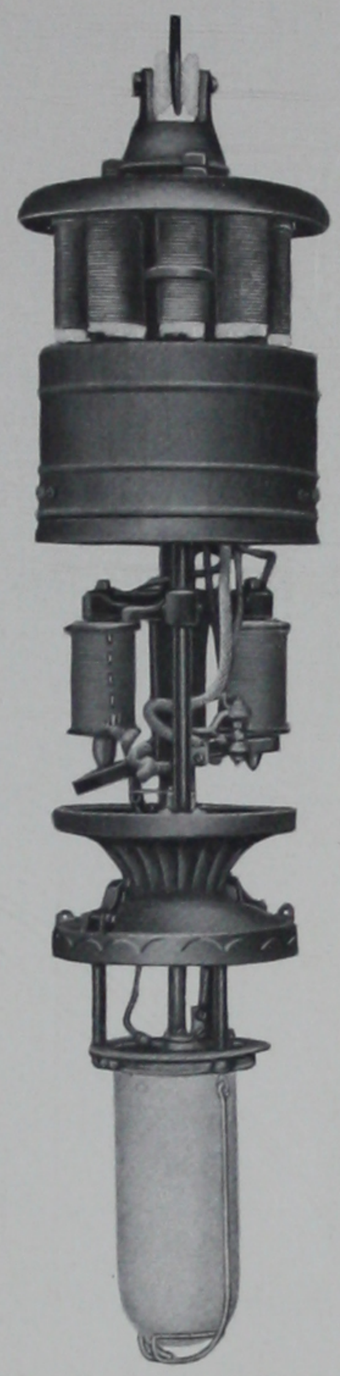
This lamp is designed to operate two in series on 220 volts. If one lamp of a group of two is turned off, or if the carbons in one lamp are consumed, the other lamp is extinguished.

In order to keep the heat of the rheostat from reaching the mechanism of the lamp, the rheostat is mounted in a separate compartment on top of arc lamp. The shell of the rheostat is provided with bayonet catches and may be readily removed. The current enters the lamp at the positive binding post, passes through the upper carbon to the lower, and from here through the series magnet to the rheostat. From the rheostat the current passes through the switch to the negative binding post. The shunt magnet is connected across the arc. A cut-out is provided for the shunt circuit of the lamp. This cut-out is operated by the series magnet. When the latter is energized the armature of the cut-out is attracted, closing the shunt circuit. The purpose of the cut-out is to prevent the passage of heavy currents through the shunt circuit after the main circuit is broken. The standard adjustment of the lamp is 5 amperes. It can be wound for any current between 3 and 7 amperes. For rooms with low ceilings, the rheostat may be taken off the top of the lamp and hung at a convenient place. When ordered, the rheostat will be provided with suitable binding posts.

Arc Lamp, Type 425



Type 425 lamp showing accessibility of rheostat without disturbing any other part of the lamp.



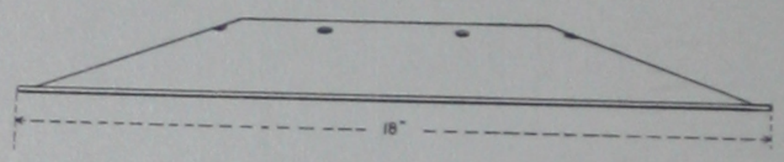
Side view of movements of lamp, showing series and shunt magnets.

This lamp is designed to operate five in series on 550 to 600 volts, and two in series on 220 to 250 volts. If one lamp of a group is turned off, or if the carbons are consumed, a resistance is cut into the circuit which takes the place of the arc and keeps the current at its normal value, while the balance of the lamps burn without interruption.

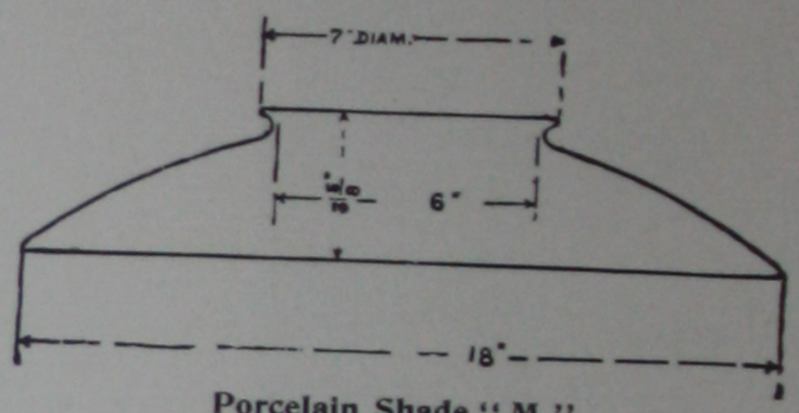
The rheostat is mounted in a separate compartment on the top of the lamp, and consists of eight unit resistance drums. A number of them are permanently in circuit and serve as steadying resistance. The remaining resistance drums are cut into circuit by the automatic cut-out. The main or series circuit of the lamp passes through the upper and lower carbons, the series magnet, the switch and the steadying resistance. The shunt magnet is connected across the arc. When the substitutional resistance is cut in, the current passes from the positive binding post through the cut-out, the switch and rheostat to the negative binding post. The substitutional resistance can be cut in manually by the hand switch.

The standard adjustment of the lamp is 5 amperes. It can be wound for any current between 3 and 7 amperes. For rooms with low ceilings, the rheostat may be taken off the lamp and hung at a convenient place. When so ordered, the rheostat will be provided with suitable binding posts.

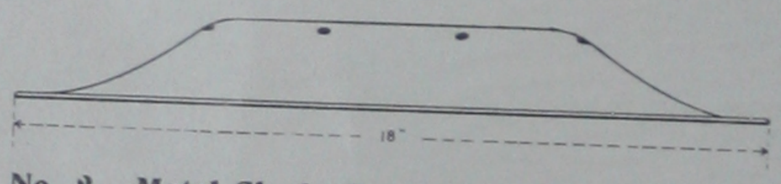
Glassware and Metal Shades



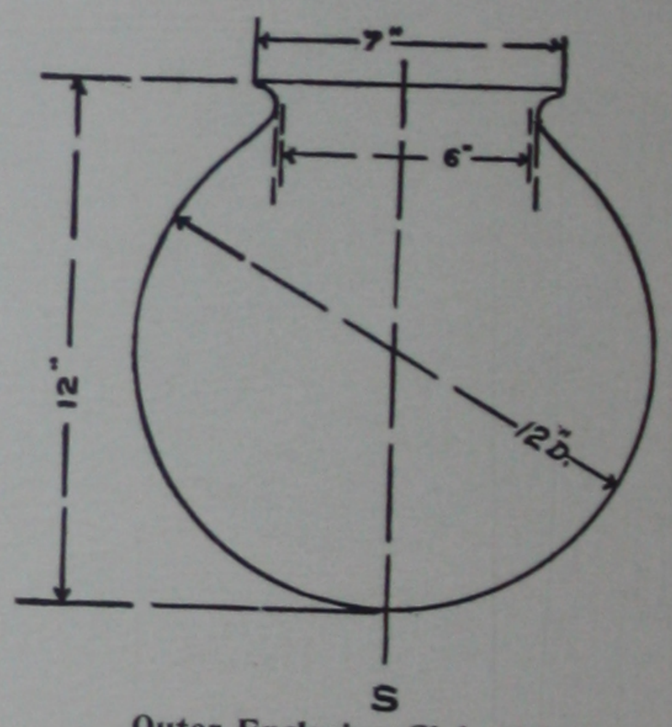
No. 1. Metal Shade, painted with white enamel on inside.



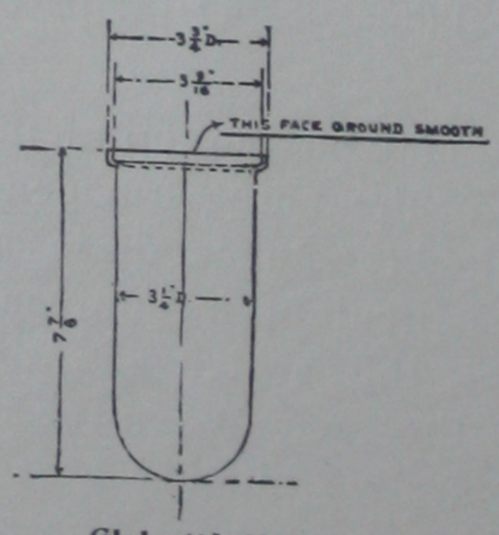
Porcelain Shade "M."



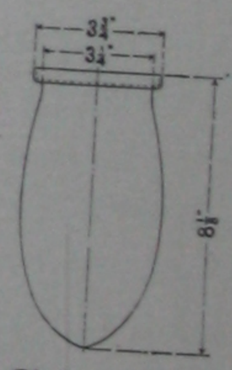
No. 2. Metal Shade, fire enameled on both sides.



Outer Enclosing Globe "S."



Globe "L."



Globe "R."

Data for Type 420 Arc Lamps

Code Word	Catalog No.	Type	Amperes	Volts at Arc	Carbon (Solid) Length in Inches		Length over all in Inches	Approximate Weight with Globe, in lbs.	Style Inner Globe	Style Outer Globe or Shade	Approximate Shipping Weight	Finish
					Upper	Lower						
Placarding	1520	*420	5	80	½ x 12	½ x 4¾	35	37	R	S or M	50	Black Japan

These lamps are to be connected two in series on 220 volts.

Data for Type 425 Arc Lamps

Placarla . .	1525	*420	5	80	½ x 12	½ x 4¾	36	43	R	S or M	60	Black Japan

These lamps are to be connected two in series on 220 volts or five in series on 550 volts.

Data for Type 414 Arc Lamps

Placarono .	1500	414	**7	72	½ x 12	½ x 4¾	27	31	R	S or M	40	Black Japan

* Type 420 and 425 can be wound for currents from 3 to 6 amperes, 3 ampere lamps will be equipped with ⅜-inch carbons.

** Can be wound for currents from 4 to 9.6 amperes.

Approximate Hours of Burning

The 5 ampere lamps, type 420 and 425, will burn about 125 hours; the 7 ampere lamps, type 414, about 100 hours.

Bulletins

A copy of each of the following Bulletins will be furnished on request.

Number		Issued
1003	Arc Lighting Dynamos	Jan., 1901
2005	Belt Driven Generators, Type "L"	April, 1903
2010	Direct Connected Generating Sets, Type "T"	July, 1903
2015	Direct Driven Generators, 125 and 250 volts, Type "L"	March, 1904
3015	Type "N" Machines	April, 1904
3020	Exhaust Fans and Steel Plate Blowers, Direct Connected	Jan., 1903
3025	Ventilating Equipment	Aug., 1903
3030	Sewing Machine Motors	Jan., 1903
3040-A	Type "D," "C" and "E" Machines	April, 1904
3040-B	Type "G" Machines	April, 1904
3050	Motor Driven Grinders	June, 1904
4000	Fan Motors	March, 1904
6005	Direct Current Circuit Breakers	May, 1903
6010	Knife Switches	Nov., 1904
7008	Arc Lighting	May, 1902
7010	Improved Interchangeable Arc Lamps	Aug., 1902
7015	Series Alternating Current Arc Lamps	May, 1903
7030	Multiple Series and Constant Current Arc Lamps for Direct Current Circuits	Dec., 1904
7035	Multiple Constant Potential Alternating Current Arc Lamps	Dec., 1904
7040	Multiple Constant Potential Direct Current Arc Lamps	Dec., 1904
8001	Arc Dynamo Regulators	Feb., 1901
9005	Police and Fire Alarm Apparatus	June, 1903

New Bulletins in course of preparation.

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MULTIPLE AND MULTIPLE SERIES ALTERNATING CURRENT ENCLOSED ARC LAMPS

BULLETIN 7035 (Replacing Bulletin 7035 of December, 1904) JUNE, 1907

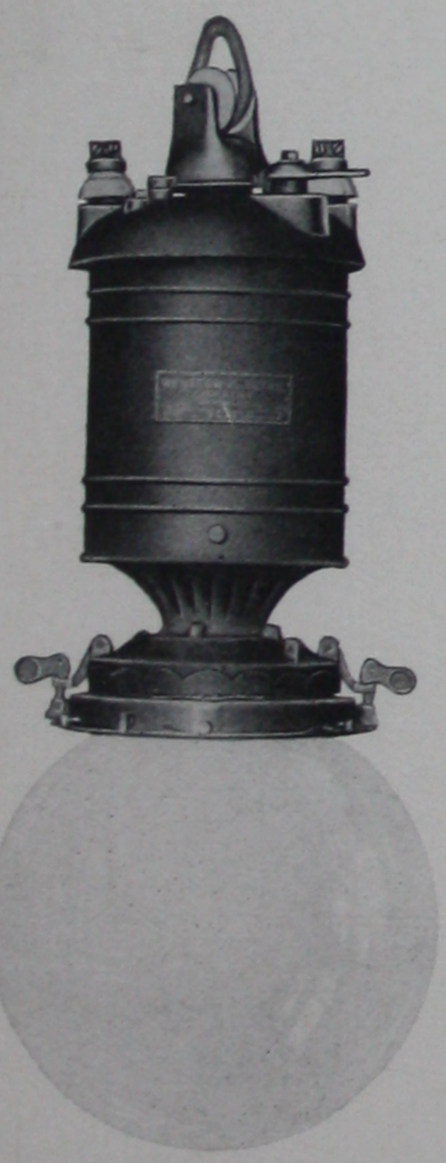


FIGURE 1
With "S" Globe

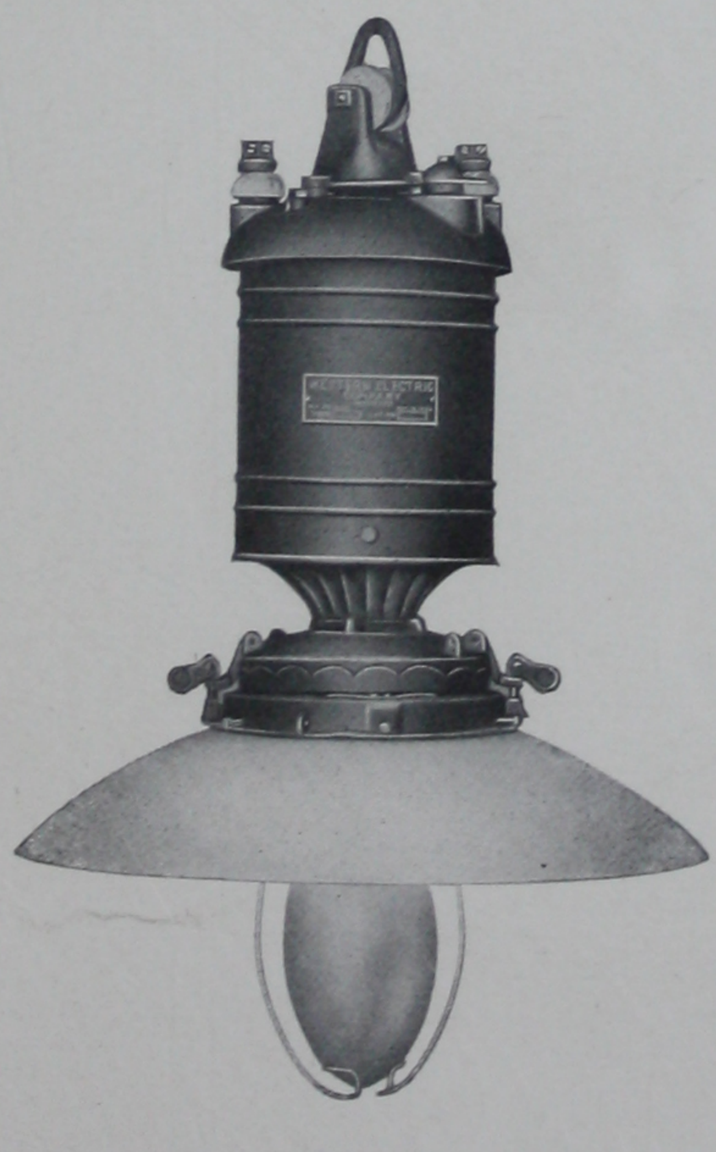


FIGURE 2
With "M" Shade

TYPES 570 and 575

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Multiple and Multiple Series Alternating Current Enclosed Arc Lamps

Introductory

AN experience of several years in the manufacture and sale of alternating arc lamps places us in a position to accurately gauge the particular features and requisites necessary in an arc lamp. The Western Electric series alternating arc light installations have proved notably successful from every standpoint, and in the new constant-potential lamp for alternating currents, illustrated herein, are included many of the features which have contributed so largely to our success. We, therefore, place before the public our latest type constant-potential alternating arc lamp, confident that its performance will establish it as a standard in perfection of design and efficiency of operation. We have so constructed the lamp that it is adapted for either indoor or outdoor service without change in any part.

MULTIPLE AND MULTIPLE SERIES
ALTERNATING CURRENT
ENCLOSED ARC LAMPS
BULLETIN NUMBER 7035

WESTERN
ELECTRIC
COMPANY

Interchangeability

The interchangeability of certain parts of arc lamps not only facilitates the operation of the lamps, but also serves to keep the cost of maintenance of the plant within reasonable limits. In the design of this lamp care has been exercised not to introduce interchangeability of parts at a sacrifice of utility.

The Western Electric multiple 110-volt alternating current lamp with ½-inch carbons may be changed readily into a 110 or 220-volt direct current lamp by changing the coils and armature and substituting a rheostat for the choke coil.

A feature common to all Western Electric lamps, and one that has attracted widespread attention, is a peculiarly shaped casting known as the waist of the lamp. Its function is to separate the operating mechanism from the arc. It insures low temperature of the operating parts, the heat of the arc being confined to its own chamber and dissipated by radiation before it can reach the mechanism chamber. This waist is closed at the bottom, to prevent the heated air rising and carrying dust into the mechanism chamber. This feature has been found of particular importance where arc lamps are operated in dusty places and where the lamps are used without the outer globes.

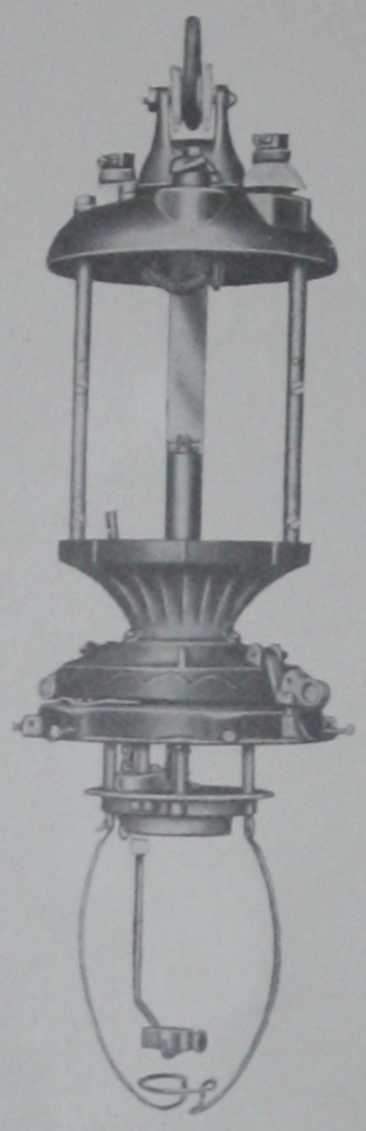


FIGURE 3
Parallel Rod Frame for Multiple Direct and Alternating Lamps

Lamp Frame

Our lamp frame, while simple in design and construction, combines rigidity and strength with a form which secures and maintains perfect alignment of the operating mechanism and forms a substantial support, also facilitating inspection or removal of parts.

Lamps having but a single tube to serve as the frame work have been found too weak to carry the mechanism, and stand the strains of practical use, shipping, etc

In Figure 3 is shown our parallel rod construction in which the cap and waist of the frame are connected by heavy, hard drawn brass tubes secured at their upper ends by means of brass hexagonal cap screws, the lower ends being fixed to the waist. The cap can be removed by taking out two screws and breaking one electrical connection.

The square tube which forms the guide for the upper carbon holder is slipped into place from below and held by two screws only on a support carried by the waist. The tube is supported at its upper end by a plate carrying a receptacle into which the tube passes and a reliable electrical connection is made to the tube. All parts of these lamp frames are accurately machined and carefully inspected before assembly, and the result is a structure which has been proved out and found not wanting in any essential requisite. In fact it is one of the main features of excellence on which we base our ability to place lamps in the hands of our customers in such condition that no readjustment will be found necessary when put in operation.

In Figure 4 we show parts of the switch mechanism and binding posts. We call particular attention to the fact that the switch blade is mounted upon its arbor by a single porcelain insulator of substantial construction. This does away with the necessity for a lot of mica washers and small screws, a source of trouble in many lamps still on the market.

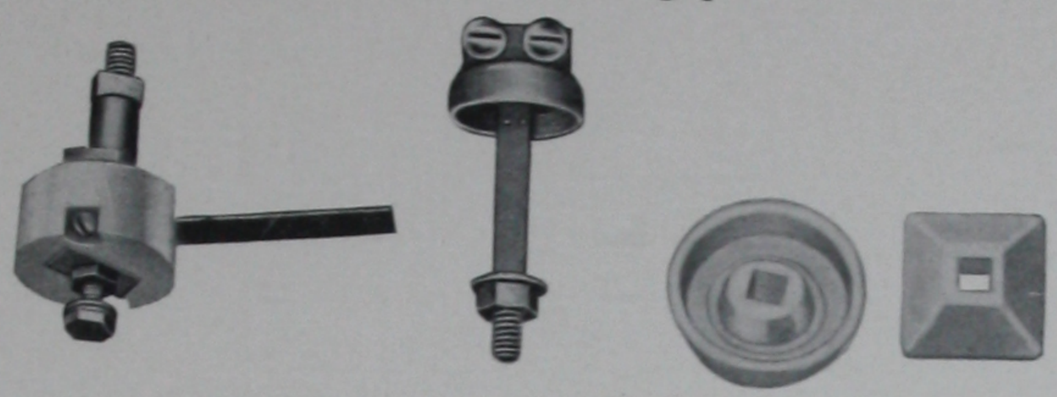


FIGURE 4. Parts of Switch and Binding Posts

The binding posts are mounted on the cap of the lamp by strong brass studs which pass through well vitrified porcelain insulators. The lower insulators are of pyramidal form and rest in special sockets formed in the cap, while the upper insulators are provided with depending flanges to shed rain or snow. The studs of the binding posts are squared and pass through square holes in the insulators. This prevents turning of the binding post and the consequent trouble from loose connections.

In many arc lamps the outer globe is held in such a way that a breaking strain is brought upon the glass. The result is frequent breakage of outer globes. Our outer globe-holding ring (Fig. 5) effectually overcomes this trouble and diminishes the cost of renewals of outer globes.



FIGURE 5
Outer globe-holding ring

The Carbon Holder and Clutch

The square tube (Fig. 6), which forms the guide for the upper carbon, limits the travel of the carbon holder and protects the copper ribbon from injury. This copper ribbon forms a flexible connection between the traveling carbon holder and the stationary tube. It possesses advantages over a spiral coil in that it is not easily kinked or thrown out of order and offers a non-inductive path for the current. The connection is so made to the square tube and carbon holder that no restraint is offered to movement of the holder. We have in this copper ribbon a device tried by several years of service, and find it exceeds in reliability and durability any other known form of spiral coil or flexible cord.



FIGURE 6
Square tube and folding ribbon

The upper carbon holder (Fig. 7), to which the ribbon is attached, is made in a substantial manner, of spring phosphor bronze and hard copper punchings, so disposed that they will firmly grasp carbons of the ordinary commercial range in diameter. The holder is of sufficient weight to overcome any ordinary frictional resistance to its movement which the upper carbon may meet. When the ordinary cheap form of split tube is used for the upper carbon holder it is often found that the carbons become loosened and the tube becoming hot loses its tension after a comparatively short time of service.



FIGURE 7
Upper carbon holder

The clutch (Fig. 8) in our arc lamp is of the double ring type, plain and simple without intricate parts, easily accessible, and adapted for commercial carbons. It effectually prevents the jarring through of the carbon.



FIGURE 8
Clutch

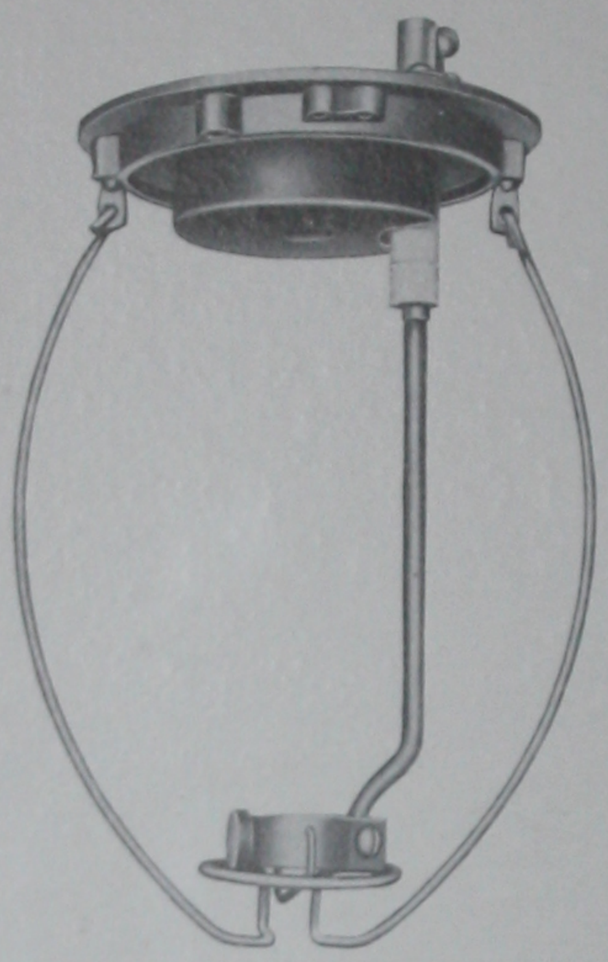


FIGURE 9
Gas check plate and inner globe supporting bail

The Gas Check

The gas check plate (Fig. 9) is made of cast brass, hence is not subject to the corrosion always found on cast-iron plates. It will not warp, crack or roughen.

The double gas chamber (Fig. 10) mounted upon the lower surface of the gas check plate, is so formed as to retard the escape of the gases and restrict the admission of air, thus insuring long life in the carbons and high economy. The inner globe is supported by a bail, which is pivotally attached to the gas check plate and is pressed into position by the spring portion of the bail resting against the lower end of the globe.

No Noise or Vibration

Excessive noise and vibration in starting has been practically overcome by the slow separation of the carbons in the initial striking of the arc.

Annoyance is often experienced in alternating arc lamps from the vibration and resulting mechanical rattle imparted by the regulating magnet and the armature. This is effectually prevented in the Western Electric lamp by having the magnet suspended and the vibration of the armature taken up by springs. The magnet used in this arc lamp is of the plain, horseshoe type, possessing the advantage of maintaining a uniform pull throughout a long range of movement, thus tending to the maintenance of constant current, even when the line voltage varies considerably. Attached to the armature of this magnet, through the medium of the spring, is a lifting link leading downward to the clutch and a connecting rod leading upward to the piston of the dashpot. The material used in this dashpot has been selected with special reference to its ability to stand long continued use and to its freedom from irregular expansion.

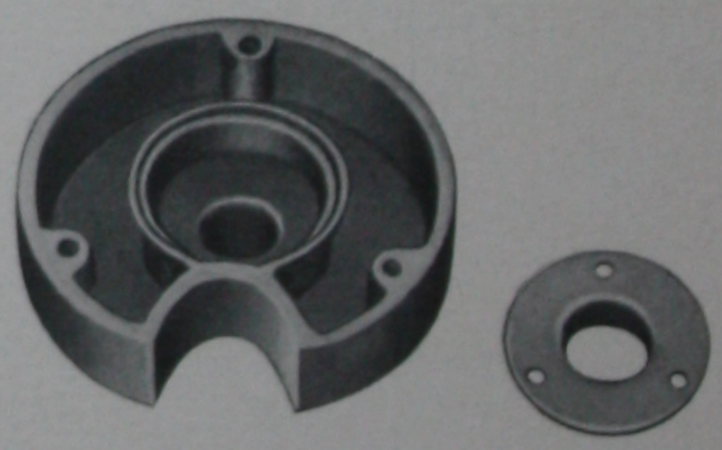


FIGURE 10
Double gas chamber

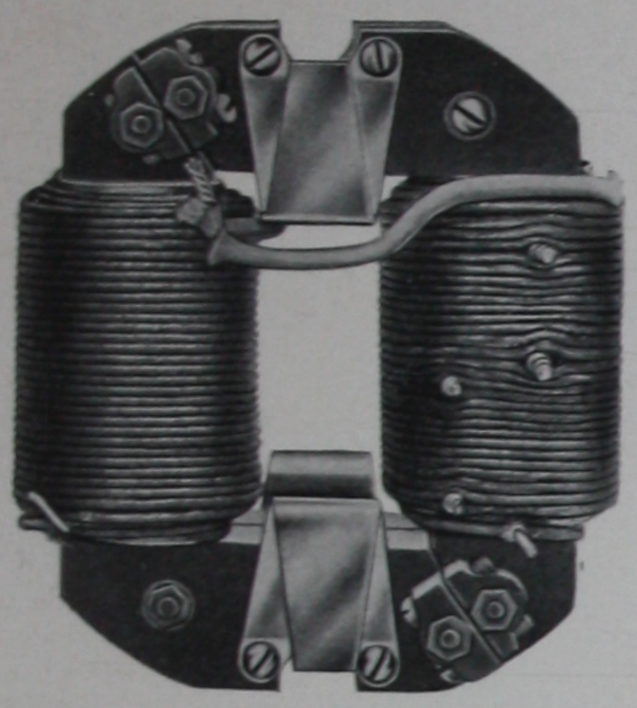


FIGURE 11
View of choke coil, showing taps for frequency and voltage adjustment

Owing to the unstable nature of the arc it is necessary to provide a certain amount of steadying resistance in series with the arc. This is provided by an inductive resistance consuming but a few watts. The inductive resistance, or choke coil (Fig. 11) is mounted in such a way as to be readily removed from the lamp for inspection.

The shell (Fig. 12) for enclosing the movement of the Western Electric lamp is made with a view to durability. Where other makers have recourse to spun rings and other perishable contrivances for providing the necessary radiating surface, we provide a plain cylindrical shell which can be relied upon to last for many years, even in the most exposed places.

Reflectors, Shades and Glassware

Unless otherwise ordered, arc lamps types 670, 675, 690 will be equipped with clear "S" outer and clear "R" inner globes.

Types 670-S and 675-S will be equipped with an opalescent "R" globe and an "M" opal glass shade.

When so ordered we can furnish our No. 1 metal reflector in place of the "S" outer globe or "M" shade on the above type lamps.

The No. 1 metal shade is 18 inches in diameter, painted with white enamel on the under side and black on the upper side.

The No. 2 metal reflector is 18 inches in diameter and is fire enameled, white on the under side and black on the upper side.



FIGURE 12
Shell

Any of our metal reflectors except No. 3 are adapted for attachment to the outer globe-holding ring by means of screws. They may, therefore, be used on a lamp having both inner and outer globes. The "M" opal glass shade is held in outer globe ring in place of an "S" outer globe. The No. 3 metal reflector is 22 inches in diameter, fire enameled in white on lower surface, black or blue on upper surface. They can be used only with a special holder.

Range in Voltage and Frequency

The lamp can be operated on circuits ranging in voltage from 95 to 125 volts ither at 60 or 125 cycles. The choke coil is provided with two coils, each wound upon a limb of the core. On 60 cycles all the coils are in use; on 125 cycles only part of one coil. This coil is provided with a number of taps which permit the cutting in or out of turns, thereby making the lamp adaptable for high or low line pressure.

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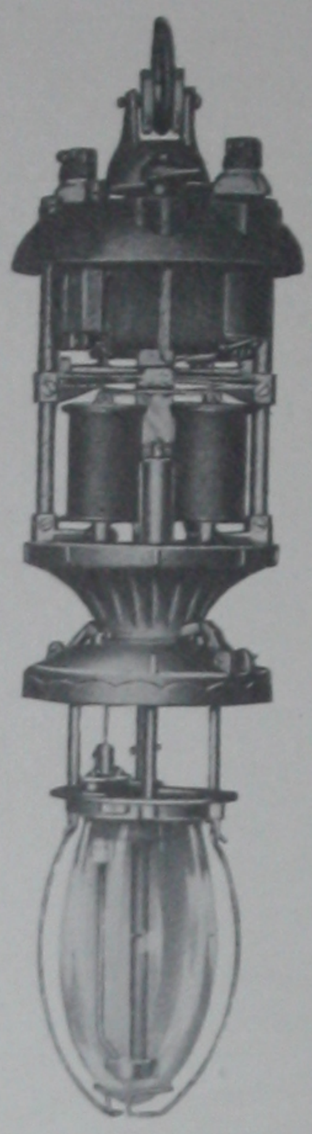


FIGURE 13
View of lamp mechanism, showing switch side with frequency terminal



FIGURE 14
View of lamp mechanism, showing taps for adjusting lamps for various voltages



FIGURE 15
TYPE 550
Marine Lamp



FIGURE 16
TYPES 570 and 575
With No. 2 Metal Shade



FIGURE 17
View of our Type 530 Lamp showing the mechanism



FIGURE 18
View showing the special attachment used on our Type 530 and 531

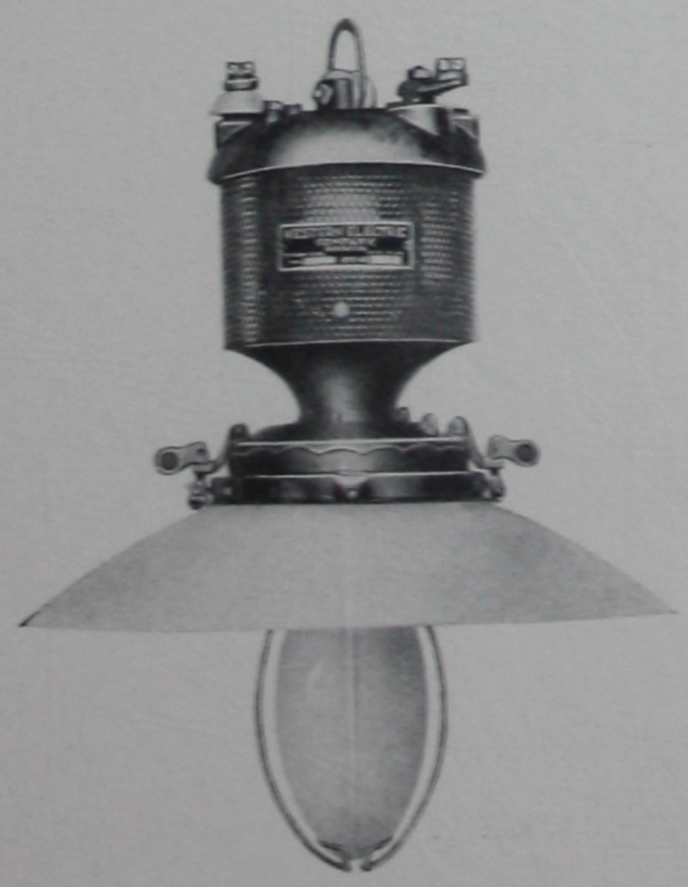


FIGURE 19
Type 570 S Lamp with R Globe and M Shade

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Multiple Alternating Current Arc Lamp

TYPE 570-S

The demand for a short lamp is here met by a structure which combines elegance of appearance with compact form and small space. It is in fact a step forward which cannot fail to appeal to the practical man. Objection to the use of arc lamps is often based on their length and the consequent inability to get the light where it was wanted.

We especially call the attention of illuminating engineers and other users to the numerous features of excellence to be found in this lamp:

It is short.
It economizes current.
It has moisture-proof insulation.
It is accurately proportioned.
It is shapely in form.
It will last long.
It will not burn out.
It is moderate in weight.
It economizes space.
It has fire-proof insulation.
It is made of best material.
It is well finished.
It will burn long.
It will not go out.

OPERATION.—In the matter of regulation and steadiness of operation this lamp is not excelled even by the most perfectly designed full size arc lamps. The arc is established and maintained so perfectly that great steadiness and freedom from interruption results.

GLASSWARE.—The glassware used is of the standard size and shape used on the larger types of lamps. This permits the use of long and short lamps in arc installations without the necessity of carrying two lines of glassware.

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Multiple Series Alternating Current Arc Lamps

TYPES 530 and 535.

In these lamps use is made of the same mechanical device which is found so useful in controlling the arc voltage of direct current lamps when operated in series. It is found to give very satisfactory results in preserving uniformity in the voltage of a series of arcs when operating on constant potential.

With the 530 lamp 2 in series on 220 volts much more satisfactory results in the matters of efficiency and first cost are obtained than with any system involving the use of compensating or balancing coils.

Lamps are adapted for either indoor or outdoor use.

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Data for Western Electric Multiple Alternating Arc Lamps

For all Commercial Voltages (95 to 125 Volts) and Frequencies (60 to 133 Cycles). Lamps are adapted for either in or outdoor use.

Type	Code Words	Terminal Volts	Arc Volts	Amp.	Carbons		Weight	Length	Case
					Upper	Lower			
550	Placavamo	110	72	6	½ x 12	½ x 4¾	39	26"	Zinc
570	Placassimo	110	72	6	½ x 12	½ x 4¾	32	28"	"
570 "S"	Placassimos	110	72	6	½ x 9	½ x 4¾	30	20"	"
575	Placatorum	110	72	4	⅜ x 12	⅜ x 4¾	32	28"	"
575 S	Placatorums	110	72	4	⅜ x 9	⅜ x 4¾	30	20"	"

Multiple Series A. C. Lamps

530	Placawat	2 on 220	72	6	½ x 12	½ x 4¾	32	28"	Zinc
535	Placawox	2 on 220	72	4	⅜ x 12	⅜ x 4¾	32	28"	"

The above Code words call for zinc cases; when copper cases are wanted add the ending "ed"; when brass cases are wanted add the ending "est".

Copper case lamps will be furnished with cases made of copper with either of the following finishes: polished copper, dipped copper, oxidized copper, Japanese copper and black enamel.

When specially ordered we can furnish cases made of brass with either of the following finishes: polished, dipped or brushed brass.

Zinc cases can be furnished with either of the following finishes: black enamel, oxidized copper or Japanese copper.

Unless otherwise specified, orders will be filled as follows: copper case lamp will be furnished with an oxidized copper case; zinc case lamps will be furnished with a black enamel zinc case.

Glassware and Metal Shades

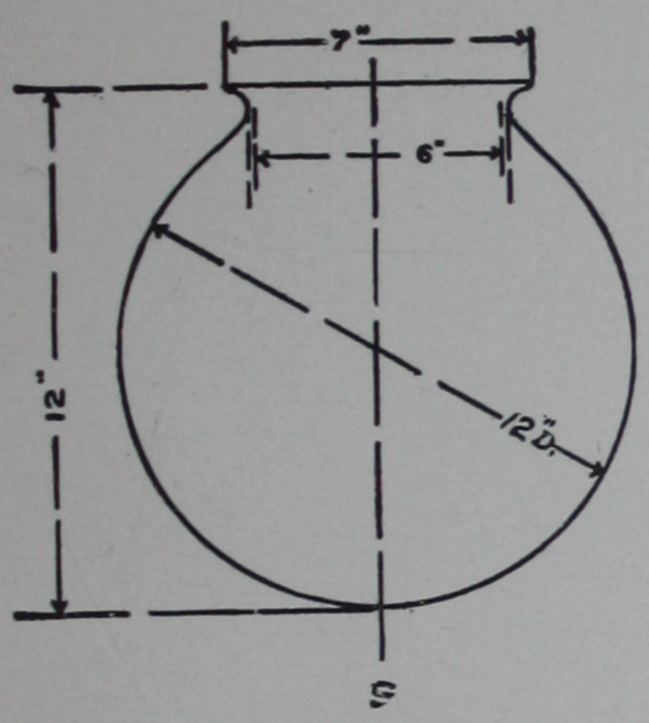


FIGURE 20
Outer Enclosing Globe S

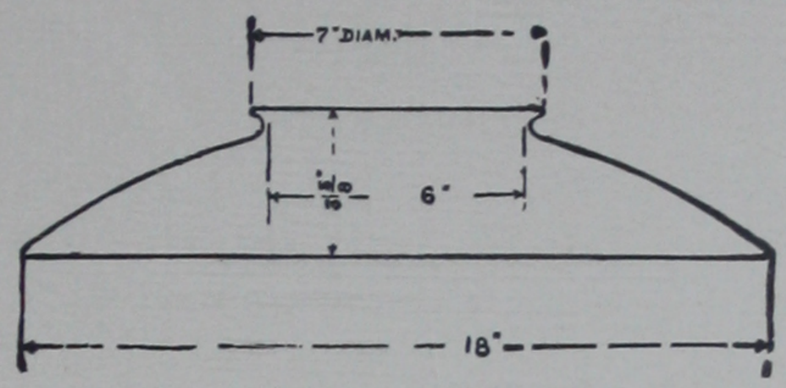


FIGURE 21
Shade M, Opal Glass

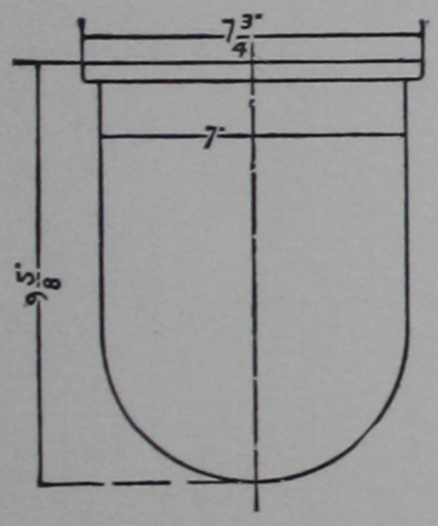


FIGURE 22
Outer Globe T

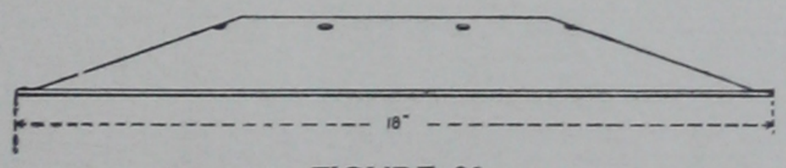


FIGURE 23
No. 1 Metal Shade
Painted with white enamel on inside

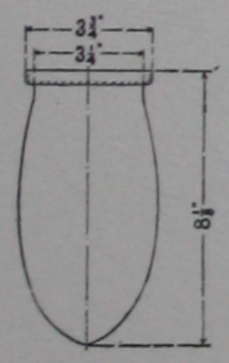


FIGURE 24
Inner Globe R

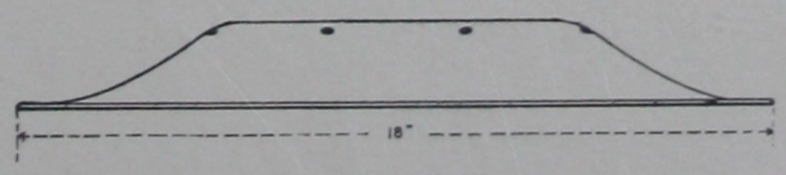


FIGURE 25
No. 2 Metal Shade
Fire enameled on both sides

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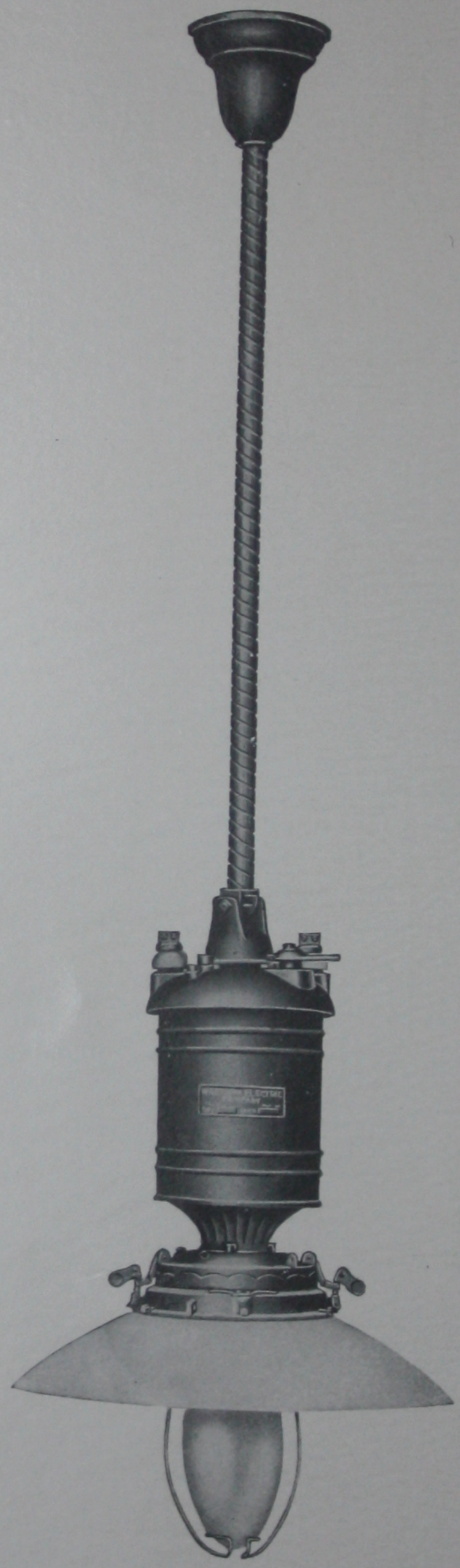


FIGURE 26
Type 570 and 575, with Rope Tubular Suspension
Can be supplied in any lengths to suit customer's requirements

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Bulletins

A Copy of each of the following Bulletins will be furnished on request.

Number		Issued
1003	Arc Lighting Dynamos	January, 1901
2005	Belt Driven Generators, Type "L"	April, 1903
2010	Direct Connected Generating Sets, Type "T"	July, 1903
2015	Direct Driven Generators, 125 and 250 volts, Type "L"	March, 1904
3015	Type "N" Machines	April, 1904
3021	Exhaust Fans and Steel Plate Blowers, Direct Connected	May, 1907
3025	Ventilating Equipment	August, 1903
3030	Sewing Machine Motors	January, 1903
3040-A	Type "D" "C" and "E" Machines	April, 1904
3040-B	Type "G" Machines	April, 1904
3050	Motor-Driven Grinders	June, 1904
4007	Fan Motors	April, 1907
6005	Direct Current Circuit Breakers	May, 1903
6010	Knife Switches	November, 1904
7008	Arc Lighting	May, 1902
7010	Improved Interchangeable Arc Lamps	August, 1902
7015	Series Alternating Current Arc Lamps	May, 1903
7040	Multiple Constant Potential Direct Current Arc Lamps	December, 1904
8001	Arc Dynamo Regulators	February, 1901
9005	Police and Fire Alarm Apparatus	June, 1903

New Bulletins in course of preparation.

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MULTIPLE AND MULTIPLE SERIES
ALTERNATING CURRENT
ENCLOSED ARC LAMPS
BULLETIN NUMBER 7035

C1.32

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MULTIPLE AND MULTIPLE SERIES DIRECT CURRENT ENCLOSED ARC LAMPS

BULLETIN 5512 (Replacing Bulletin 7040 of December, 1904) AUGUST 1, 1907

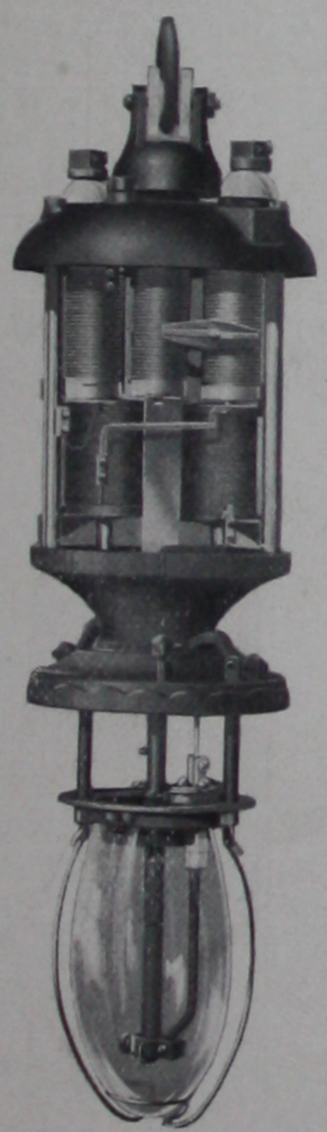


FIGURE 1
View of lamp mechanism, showing multiple unit rheostat and adjustment for various voltages.

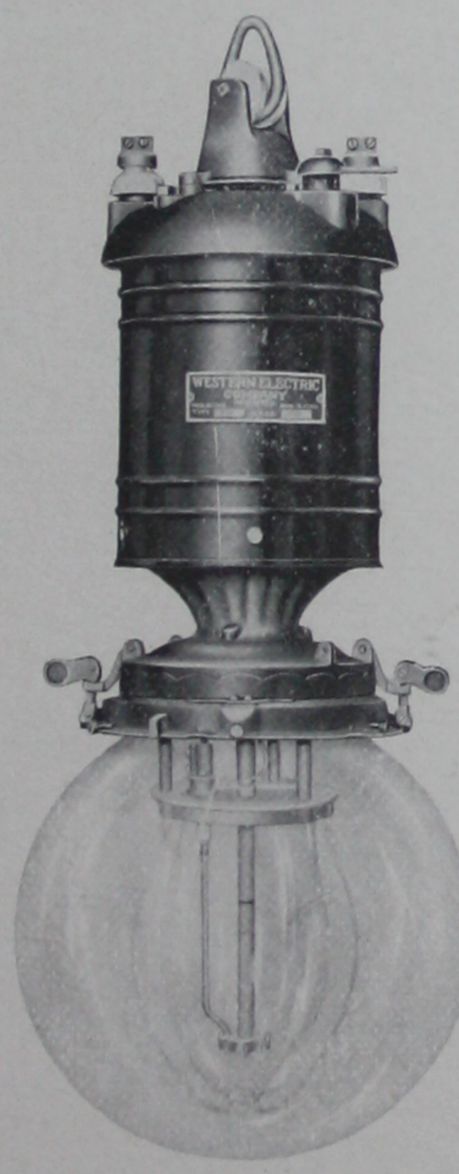


FIGURE 2
With "S" Outer Globe

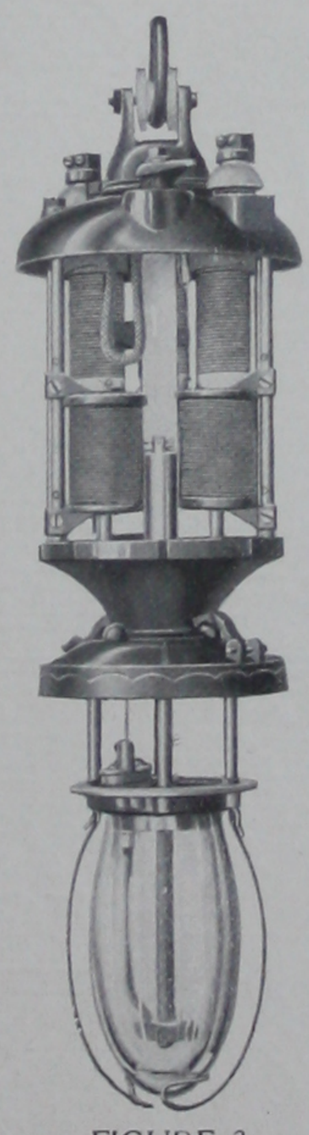


FIGURE 3
View of lamp mechanism, showing lifting coil and dash pot.

TYPES 670, 675 and 690

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Multiple and Multiple Series Direct Current Enclosed Arc Lamps

Introductory

THE Western Electric well-known lines of interchangeable direct and alternating-current arc lamps have come into very extensive use in central stations and isolated plants and have risen high in the esteem of users generally. However, experience always points a way toward improvement and we are pleased to offer our patrons a number of new features tending toward simplicity, reliability and perfection of action. We call particular attention to the indestructible rheostat and the substantial construction of the regulating mechanism, the porcelain-insulated terminals, heavy carbon holders and simplified form of switch. A full description of these features, illustrated with numerous cuts, is given herewith.

Interchangeability

The interchangeability of certain parts of arc lamps not only facilitates the operation of the lamps, but also serves to keep the cost of maintenance of the plant within reasonable limits. In the design of the new Western Electric lamp care has been exercised not to introduce interchangeability of parts at a sacrifice of utility. As very many of the parts which go to make up these arc lamps have been used in our lamps for several years and their reliability thoroughly proven, we feel warranted in making the statement that the lamps, both in design and construction, are well suited to all the requirements of service.

A 110 volt direct current arc lamp with ½-inch carbons may be readily changed into a 220 volt arc lamp by merely substituting the proper coils and rheostat. Moreover, it may be changed into an alternating lamp by changing the coils, armature, side rod of lower carbon holder and substituting a choke coil in place of the rheostat. The design of the lamp is such that all of these changes can be readily and easily made.

A feature common to all Western Electric lamps, and one that has attracted widespread attention, is a peculiarly shaped casting known as the waist of the lamp. Its function is to separate the operating mechanism from the arc. It insures low temperature of the operating parts, the heat of the arc being confined to its own chamber and dissipated by the radiating surface of the casting before it can reach the mechanism chamber. The waist is closed at the bottom by a ring which prevents the heated air rising and carrying dust into the mechanism chamber. This feature has been found of great benefit where arc lamps are operated in dusty places and in cases where the outer globe is dispensed with.

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Lamp Frame

Our lamp frame, while simple in design and construction, combines rigidity and strength with a form which secures and maintains perfect alignment of the operating mechanism, forms a substantial support therefor, and facilitates inspection or removal of parts.

Lamps having but a single tube to serve as the frame work have been found too weak to carry the mechanism, and stand the strains of practical use, shipping, etc.

In Figure 4 is shown our parallel rod construction in which the cap and waist of the frame are connected by heavy, hard drawn brass tubes secured at their upper ends by means of brass hexagonal cap screws, the lower ends being fixed to the waist. The cap can be removed by taking out two screws and breaking one electrical connection.

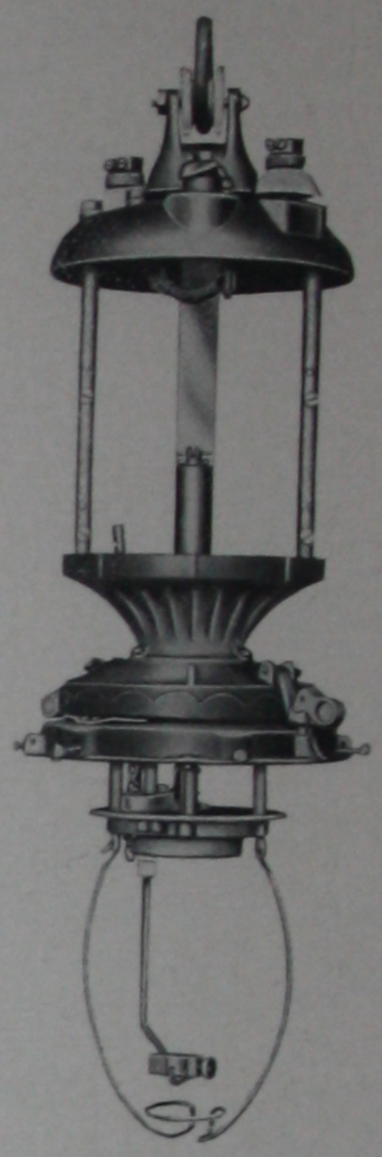


FIGURE 4
Parallel rod frame for Multiple Direct and Alternating Current Lamps

The square tube which forms the guide for the upper carbon holder is slipped into place from below and held by two screws only on a support carried by the waist. The tube is supported at its upper end by a plate carrying a receptacle into which the tube passes and a reliable electrical connection is thus made to the tube. All parts of these lamp frames are accurately gauged and carefully inspected before assembly, and the result is a structure which has been proved out and found not wanting in any essential requisite. In fact it is one of the main features of excellence on which we base our ability to place lamps in the hands of our customers in such condition that no readjustment will be found necessary when put in operation.



FIGURE 5. The switch-blade and binding posts are insulated by well vitrified square base porcelain insulators.

In Figure 5 we show parts of the switch mechanism and binding posts. We call particular attention to the fact that the switch blade is mounted upon its arbor by a single porcelain insulator of substantial construction. This does away with the necessity for a lot of mica washers and small screws, a source of trouble in many lamps still on the market.

The binding posts are mounted on the cap of the lamp by strong brass studs which pass through well vitrified porcelain insulators. The lower insulators are of pyramidal form and rest in special sockets formed in the cap, while the upper insulators are provided with depending flanges to shed rain or snow. The studs of the binding posts are squared and pass through square holes in the insulators. This prevents turning of the binding post and the consequent trouble from loose connections.

In many arc lamps the outer globe is suspended in such a way that a breaking strain is brought upon the glass and the result is the frequent breakage of outer globes. In the Western Electric lamp the outer globe-holding ring (Fig. 6) effectually overcomes this trouble and diminishes the cost of renewals of outer globes.



FIGURE 6
Outer globe-holding ring

The Carbon Holder and Clutch

The square tube (Fig. 7), which forms the guide for the upper carbon, limits the travel of the movement of the carbon holder and protects the copper ribbon from injury. This copper ribbon forms a flexible connection between the traveling carbon holder and the stationary tubes. It possesses the advantage over a spiral coil that it is not easily kinked or thrown out of order and offers a non-inductive path for the current; at the same time the attachment is so made to the square tube and carbon holder that no strain is brought to bear at its ends. We have, in this copper ribbon, a device tried by many years of service, and find it to exceed in reliability and durability any known form of spiral coil or flexible cord.



FIGURE 7
Square tube and folding ribbon

The upper carbon holder (Fig. 8), to which the ribbon is attached, is made in a substantial manner, of spring phosphor bronze punchings, so disposed that they will firmly grasp carbons of the ordinary commercial range in diameter and possessed of sufficient stability and weight to overcome the slight frictional resistance which the carbon may meet. When the ordinary cheap form of spring tube is used for the upper carbon holder, it is often found that the carbons become loosened and the springs becoming hot lose their tension after a comparatively short time of service.



FIGURE 8
Upper carbon holder



FIGURE 9
Clutch

The clutch (Fig. 9) is of the double-ring type, plain and simple, without intricate parts, easily accessible, and adapted for commercial carbons. It effectually prevents the jarring through of the carbon.

The Gas Check

The gas check plate (Fig. 10) is made of cast brass, hence is not subject to the rusting always found on cast-iron plates.

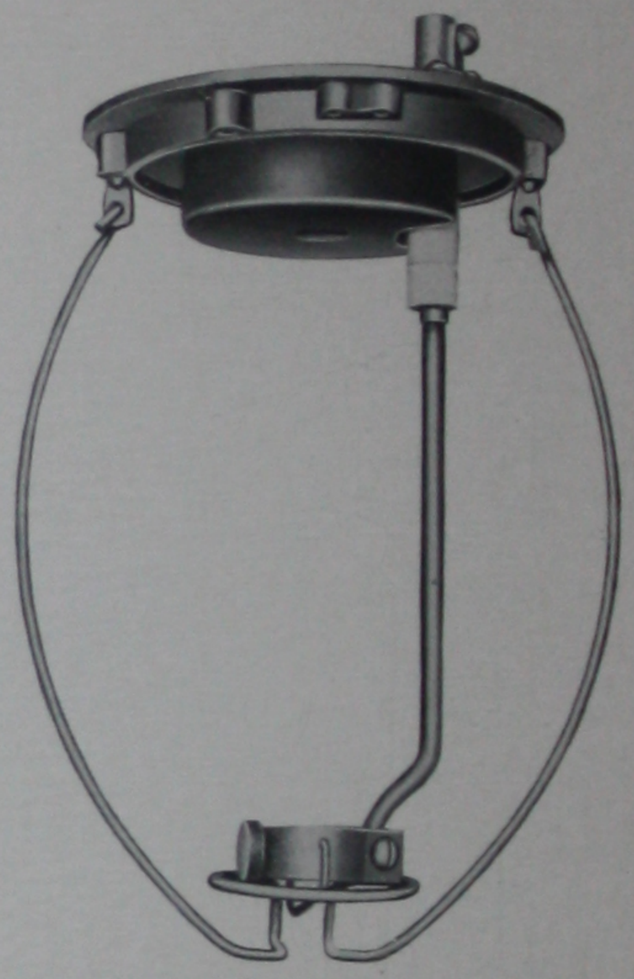


FIGURE 10
Gas check plate and bail support for inner globe

The double gas check (Fig. 11) mounted upon the lower surface of the gas check plate, is so formed as to retard the escape of the gases and restrict the admission of air, thus insuring long life in the carbons and high economy. The inner globe is supported by a bail, which is pivotally attached to the gas check plate at its two extremities and pressed into position by the spring portion of the bail resting against the lower extremity of the globe.

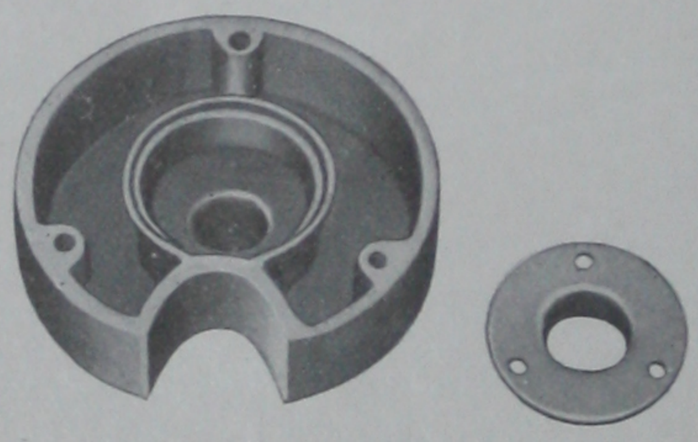


FIGURE 11
Double gas check

The Unit-Resistance Drum Rheostat

The unit resistance is built up of a number of vertical drums wound with high resistance wire (Fig. 12). The drums are all alike and readily interchangeable. They are supported on vertical steel rods and can easily be removed. The drums are made of well vitrified porcelain and provided with circular grooves in which the wire is embedded. This construction prevents the wire from sagging and short-circuiting adjacent turns. As the wire is in close proximity with the porcelain, the heat is rapidly carried off by the drum. The drums are practically indestructible. They will not crack or warp and can carry 15 to 20 amperes for an indefinite length of time. If the arc should become short-circuited the resistance will not be injured. By means of a clamp sliding up or down on the porcelain drum the number of active turns of wire can be readily adjusted.

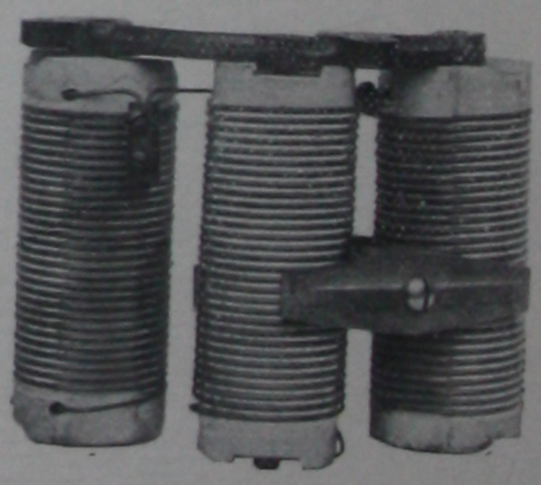


FIGURE 12
Indestructible "unit resistance" and adjusting clamp

The 110 volt lamps can be adjusted by means of a rheostat to operate on circuits ranging in voltage from 100 to 125 volts. The 220 volt lamps can be used on circuits ranging in voltage from 200 to 250 volts.

The shell (Fig. 13) for enclosing the movement is made with a view to durability. Where other makers have recourse to spun rings and other perishable contrivances for providing the necessary radiating surface, we provide a plain cylindrical shell which can be relied upon to last for many years, even in the most exposed places.



FIGURE 13
Enclosing shell for mechanism of lamp

Reflectors, Shades and Glassware

Unless otherwise ordered, arc lamps types 670, 675, 690 will be equipped with clear "S" outer and clear "R" inner globes.

Types 670-S and 675-S will be equipped with an opalescent "R" globe and an "M" opal glass shade.

When so ordered we can furnish our No. 1 metal reflector in place of the "S" outer globe or "M" shade on the above type lamps.

The No. 1 metal shade is 18 inches in diameter, painted with white enamel on the under side and black on the upper side.

The No. 2 metal reflector is 18 inches in diameter and is fire enameled, white on the under side and black on the upper side.

Any of our metal reflectors except No. 3 is adapted for attachment to the outer globe holding ring by means of screws. They may, therefore, be used on a lamp having both inner and outer globes. The "M" opal glass shade is held in outer globe ring in place of an "S" outer globe. The No. 3 metal reflector is 22 inches in diameter, fire enameled in white on lower surface, black or blue on upper surface. It can be used only with a special holder.

Approximate Hours of Burning

The 5 ampere, 110 volt lamps, equipped with ½-inch carbons will burn approximately 150 hours, often reaching a life of 160 to 180 hours; the three ampere 110 volt lamps will burn approximately 100 hours, often reaching a life of 125 hours.

The 2½ ampere, 220 volt lamps will burn approximately 150 hours, often exceeding this by a considerable margin.

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FIGURE 14
TYPE 650
Marine lamp

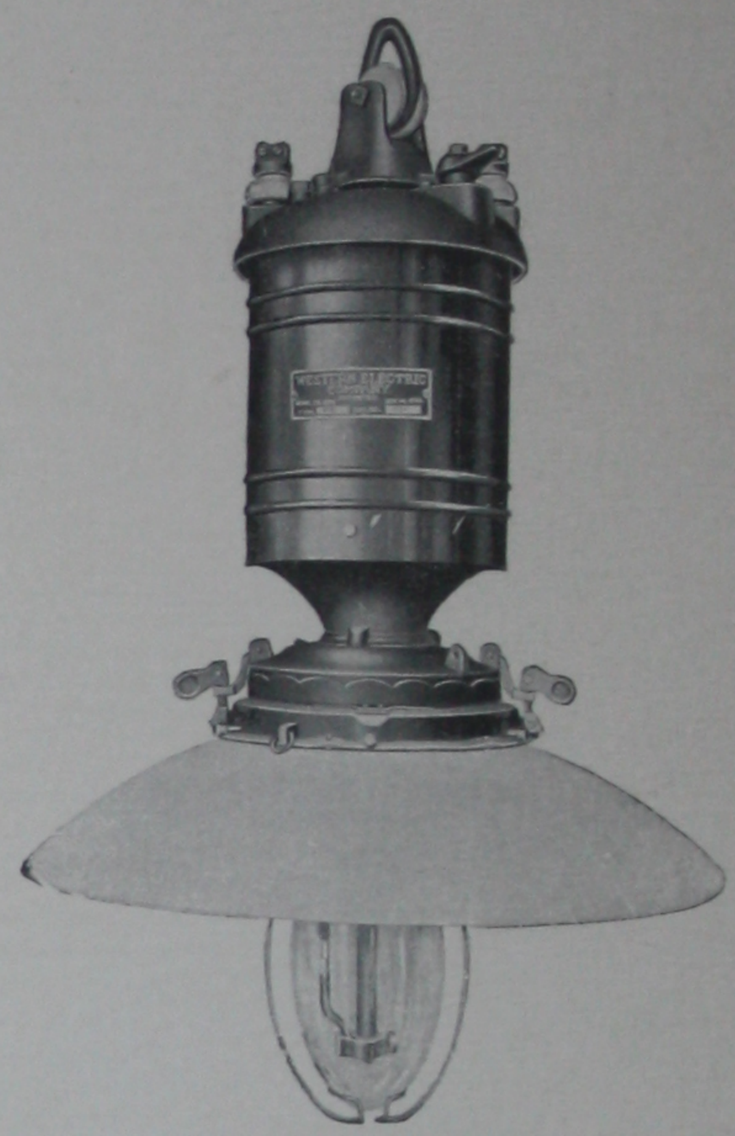


FIGURE 15
TYPE 670, 675 and 690
With "M" shade

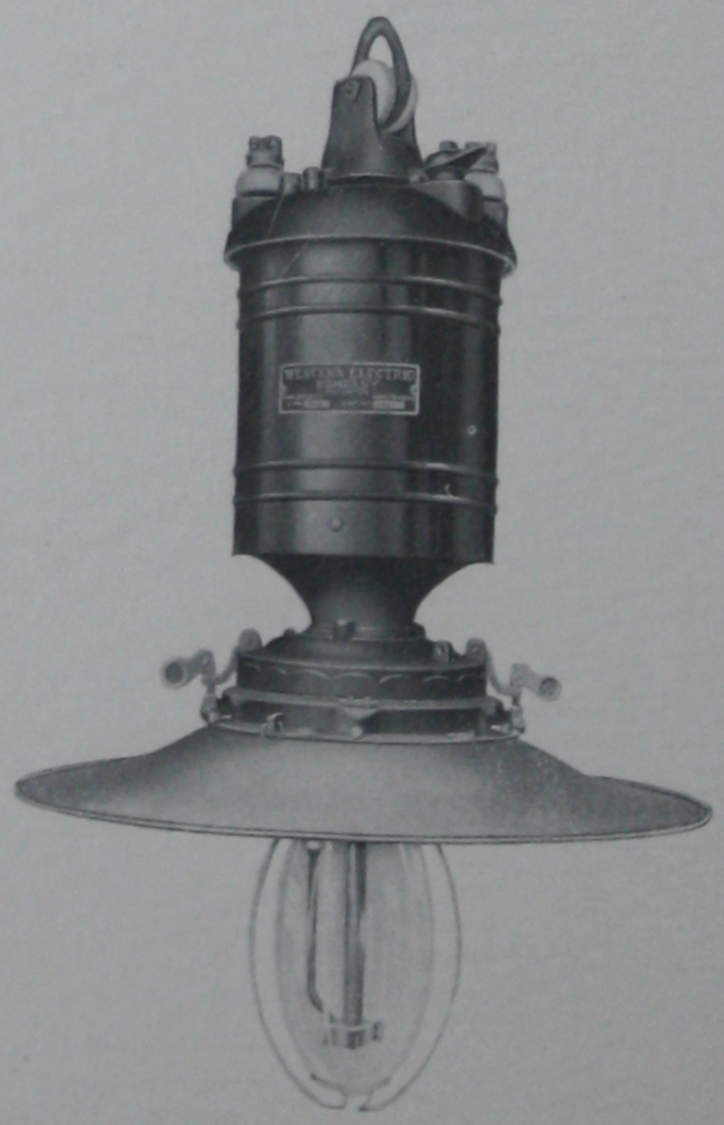


FIGURE 16
TYPE 670
With No. 2 metal shade
Dust ring and "R" globe

Multiple Series Direct Current Enclosed Arc Lamp

TYPES 430 AND 435

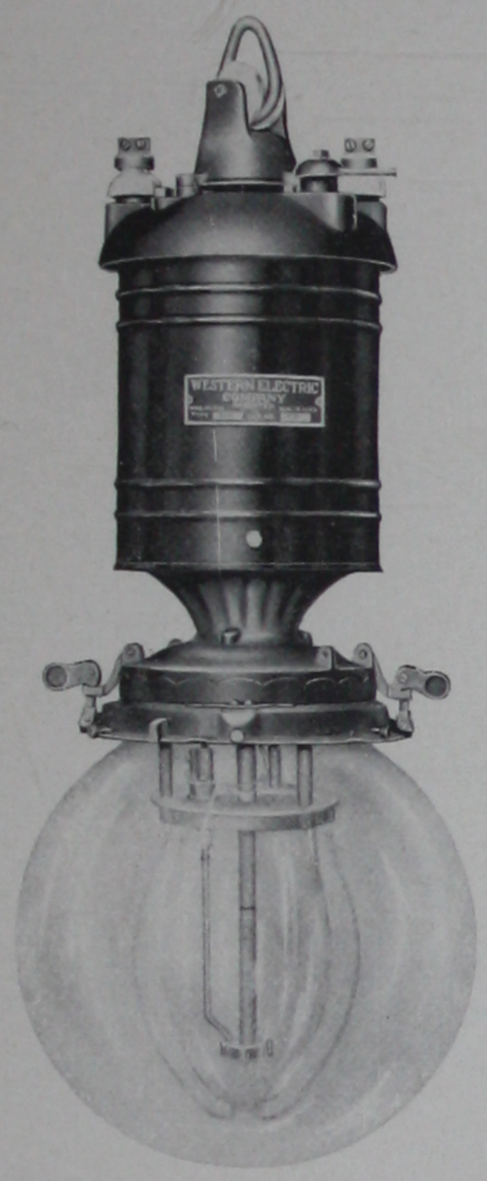


FIGURE 17

Types 430 and 435, with "S" outer globe

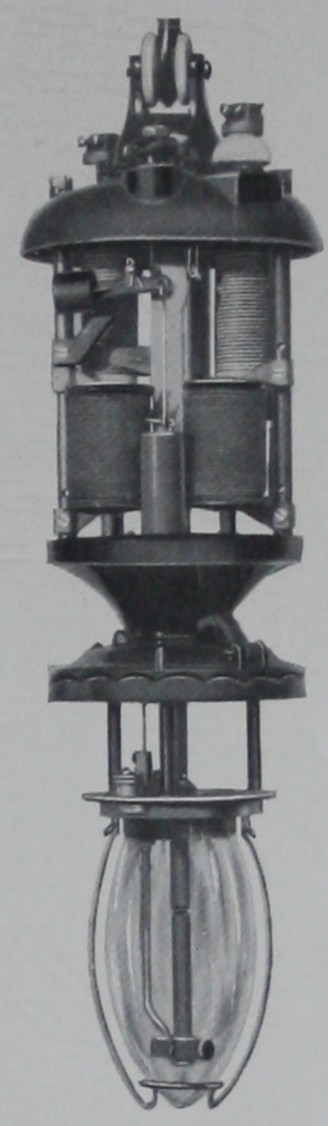


FIGURE 18

View showing the special attachment used on our types 430 and 435

In this lamp we employ a mechanism which is as simple in construction and operation as that of our ordinary multiple lamp Type 670, the main feature of difference being the addition of a small weight carried on the arm of a pivotally mounted lever which is connected by a link to the moving parts of the regulating mechanism. This simple device so modifies the action of the mechanism as to counteract the tendency of the different lamps in a series to operate with different arc lengths and voltages.

When operated 2 in series on 220 volts with a current of 5 amperes the lamp will give as perfect service in the features of intensity, color and diffusion of light as can be obtained from our regular 110 volt Type 670 lamp.

The Type 430 lamp (see Figure 17) is capable of use 2 in series on the proper voltage, but is provided with the ordinary ballasting resistance only, the cutout resistance having been omitted.

While the demands of service on 220 volt direct current systems often call for the installation of lamps to operate singly, such as our well known Type 690 and kindred types, considerations of efficiency, color, etc., will naturally give the preference to the 430 lamp wherever it can be used with convenience. To meet the demand for a low candle power lamp suitable for operation 2 in series on 220 volts, we have designed our Type 435. This lamp takes 3 amperes of current and has all the desirable mechanical and electrical features embodied in our Type 430. It gives as satisfactory results as though operating singly on 110 volts.

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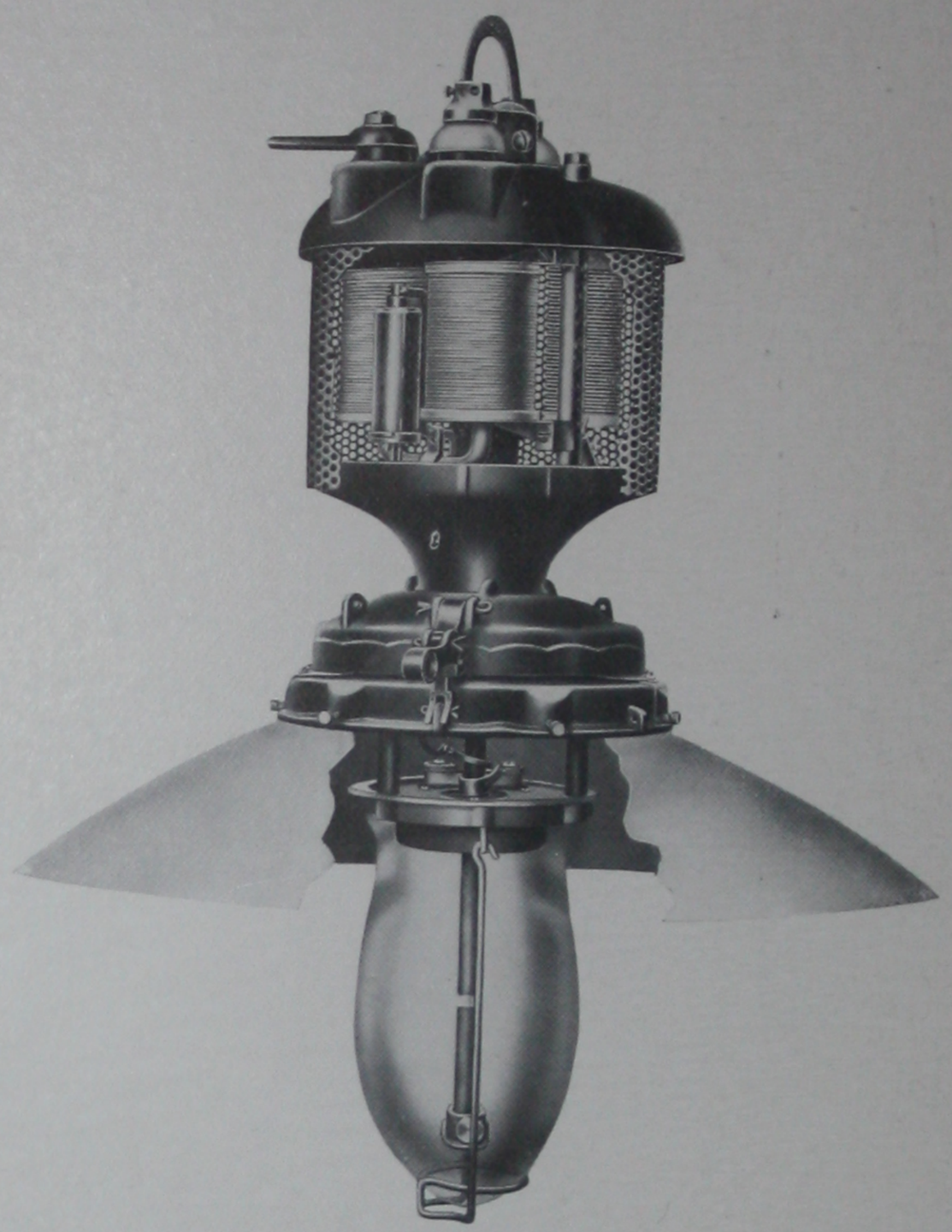


FIGURE 19
Type 670 S, showing internal mechanism

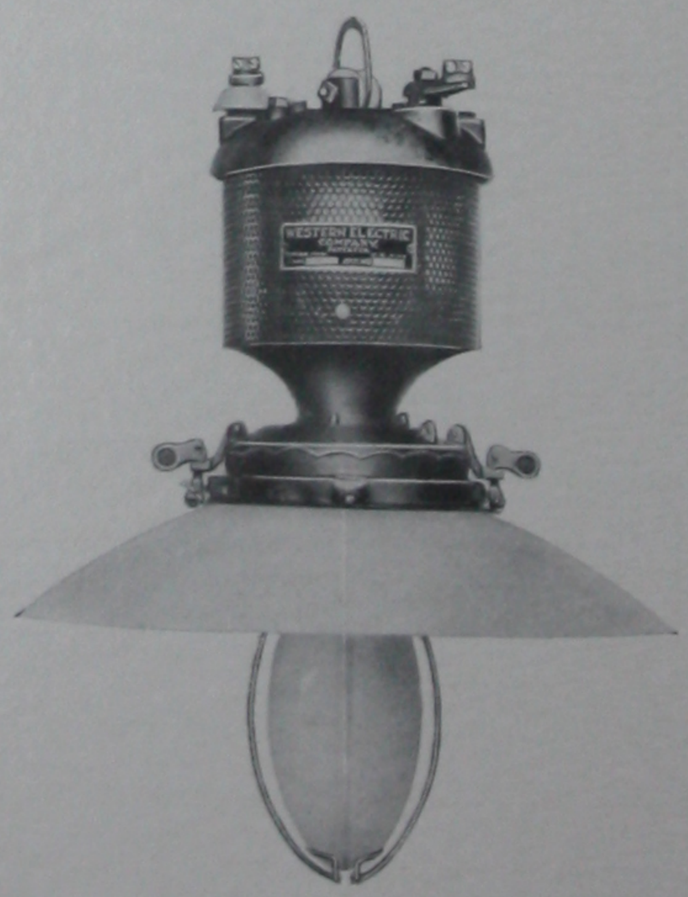


FIGURE 20
Type 670 S Lamp with R Globe and M Shade

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Multiple Enclosed Arc Lamp
Direct Current

TYPES 670-S, 675-S, 690-S

The Western Electric Company, in bringing before the public its latest improved form of indestructible short enclosed arc lamp, feels a just pride in the fact that in this new lamp it has made a decided and noteworthy step in advance.

It is specially adapted for service in buildings having low ceilings.

The attention of illuminating engineers and all users of arc lamps is called to the many features of excellence to be found embodied in the lamp.

It is short.
It economizes current.
It has moisture-proof insulation.
It is accurately proportioned.
It is shapely in form.
It will last long.
It will not burn out.
It is moderate in weight.
It economizes space.
It has fire-proof insulation.
It is made of best material.
It is well finished.
It will burn long.
It will not go out.

OPERATION.—In the matter of regulation and steadiness of operation this lamp is not excelled even by the most perfectly designed full size arc lamps. The arc is established and maintained so perfectly that great steadiness and freedom from interruption results.

GLASSWARE.—The glassware used is of the standard size and shape used on the larger types of lamps. This permits the use of long and short lamps in arc installations without the necessity of carrying two lines of glassware.

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Multiple Series Direct Current Enclosed Arc Lamp

TYPE 420

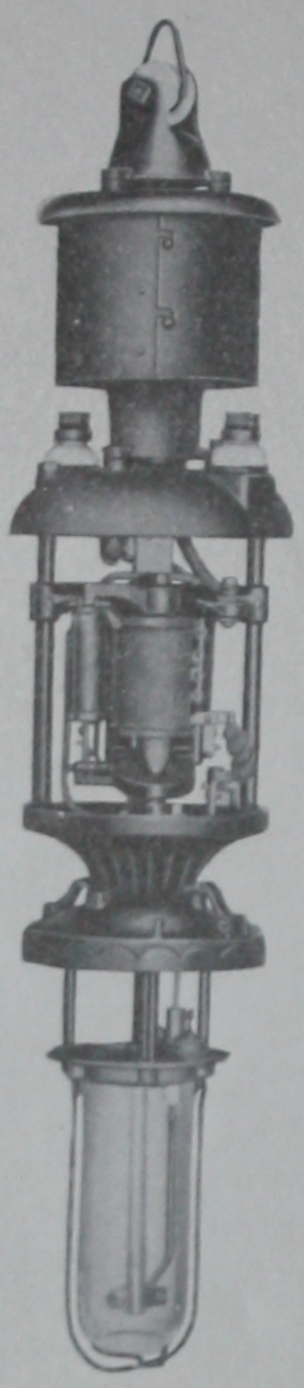


FIGURE 21

Front view of lamp, showing adjustment for series magnet and dash pot



FIGURE 22

TYPE 420 lamp showing accessibility of rheostat without disturbing any other parts of the lamp

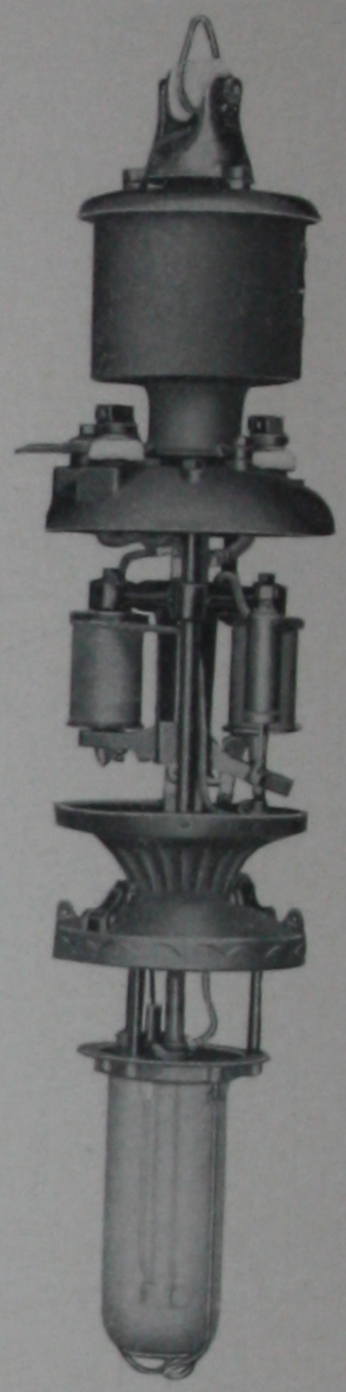


FIGURE 23

Side view of lamp, showing series and shunt magnets and dash pot

This lamp is designed to operate two in series on 220 volts. If one lamp of a group of two is turned off, or if the carbons in one lamp are consumed, the other lamp is extinguished.

In order to keep the heat from the resistance units from reaching the mechanism of the lamp, they are mounted in a separate case on top of the arc lamp. The shell of the case is provided with bayonet catches and may be readily removed. The current enters the lamp at the positive binding post, passes through the upper carbon to the lower, and from there through the series magnet to the resistance. From the resistance the current passes through the switch to the negative binding post. The shunt magnet is connected across the arc. A cut-out, operated by the series magnet, is provided for the shunt circuit of the lamp. When the series magnet is energized the armature of the cut-out is attracted, closing the shunt circuit. The purpose of the cut-out is to prevent the passage of heavy currents through the shunt circuit after the main circuit is broken. The standard adjustment of the lamp is 5 amperes. It can be wound for any current between 3 and 7 amperes.

Multiple Series Direct Current Enclosed Arc Lamp

TYPE 425



FIGURE 24
TYPE 425 lamp showing accessibility of rheostat without disturbing any other part of the lamp

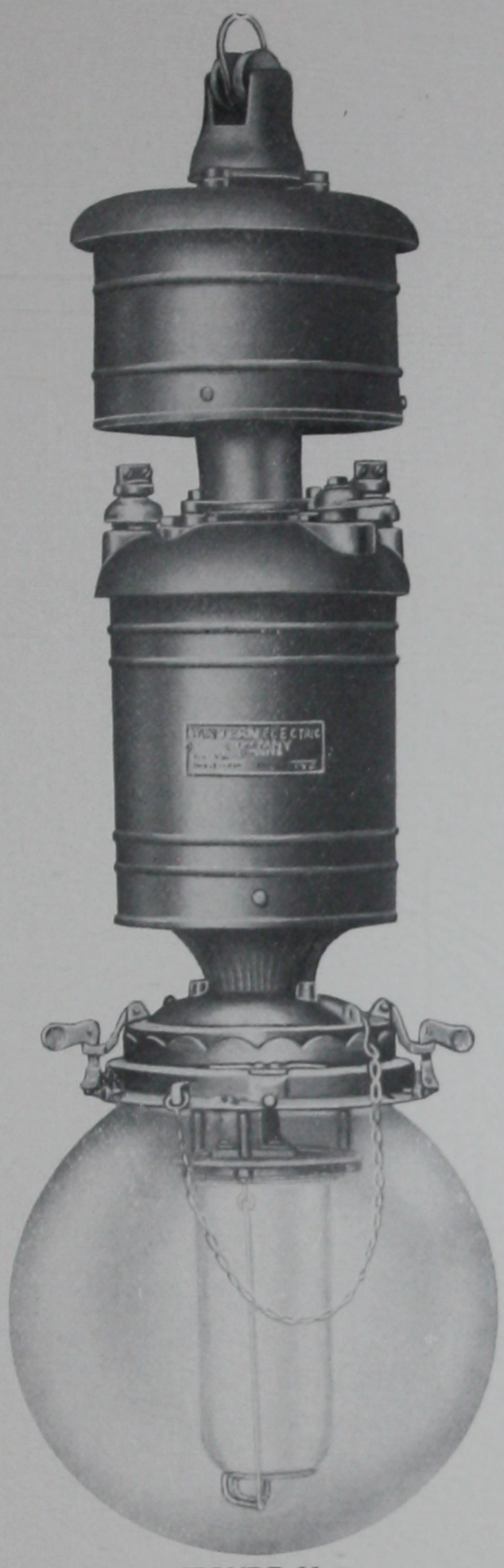


FIGURE 25
Type 425

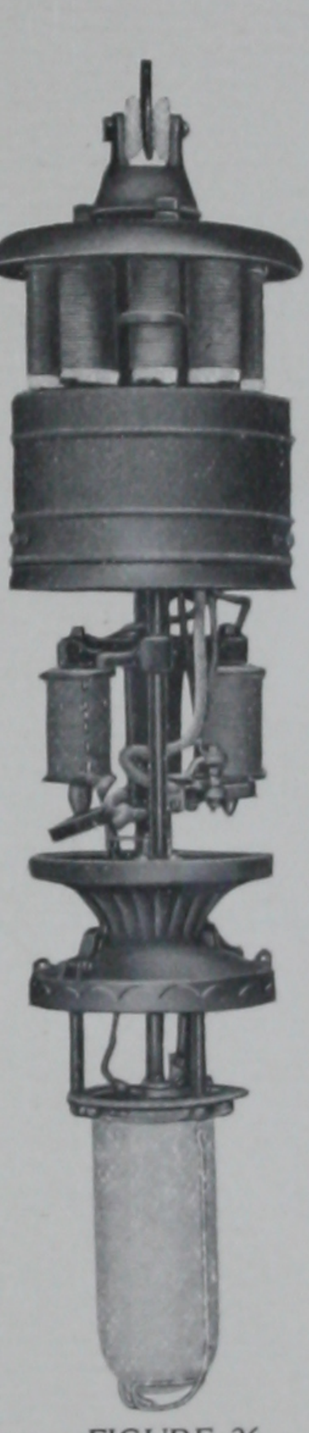


FIGURE 26
Side view of movements of lamp, showing series and shunt magnets

This lamp is designed to operate five in series on 550 to 600 volts, and two in series on 220 to 250 volts. If one lamp of a group is turned off, or if the carbons are consumed, a resistance is cut into the circuit which takes the place of the arc and keeps the current at its normal value, while the balance of the lamps burn without interruption.

The rheostat is mounted in a separate compartment on the top of the lamp, and consists of eight unit resistance drums. A number of them are permanently in circuit and serve as steadying resistance. The remaining resistance drums are cut into circuit by the automatic cut-out. The main or series circuit of the lamp passes through the upper and lower carbons, the series magnet, the switch and the steadying resistance. The shunt magnet is connected across the arc. When the substitutional resistance is cut in, the current passes from the positive binding post through the cut-out, the switch and rheostat to the negative binding post. The substitutional resistance can be cut in by the hand switch.

The standard adjustment of the lamp is 5 amperes. It can be wound for any current between 3 and 7 amperes.

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Data for Multiple and Multiple Series Direct Current Enclosed Arc Lamps

Lamps are adapted for either in or outdoor use

110 Volts

Type	Code Words	Terminal Volts	Arc Volts	Amp.	Carbons		Weight	Length	Case
					Upper	Lower			
650	Plaenkelei	110	80	5	½ x 12	½ x 4¾	32	26"	Steel
670	Plaenisti	110	80	5	½ x 12	½ x 4¾	28	28"	"
670 "S"	Plaenistis	110	80	5	½ x 9	½ x 4¾	25	20"	"
675	Plaensian	110	80	3	⅜ x 12	⅜ x 4¾	28	28"	"
675 "S"	Plaensians	110	80	3	⅜ x 9	⅜ x 4¾	25	20"	"

220 Volts

690	Plaettbar	220	150	2½	½ x 12	½ x 4¾	28	28"	Steel
690 "S"	Plaettbars	220	150	2½	½ x 9	½ x 4¾	26	20"	"
695	Plaettneb	220	150	2½	½ x 12	½ x 4¾	32	26"	"

Multiple Series Direct Current Arc Lamps

430	Plaettme	2 on 220	80	5	½ x 12	½ x 4¾	28	26"	Steel
435	Pleattnet	2 on 220	80	3	⅜ x 12	⅜ x 4¾	28	26"	"
420	Placarding	2 on 220	80	5	½ x 12	½ x 4¾	41	35"	"
425	Placarla	5 on 550	80	5	½ x 12	½ x 4¾	43	36"	"

The above code words call for steel cases; when copper cases are wanted add the ending "ed"; when brass cases are wanted add the ending "est".

Copper case lamps will be furnished with cases made of copper with either of the following finishes: polished copper, dipped copper, oxidized copper, Japanese copper and black enamel.

When specially ordered we can furnish cases made of brass with either of the following finishes: polished, dipped or brushed brass.

Steel cases can be furnished with either of the following finishes: black enamel, oxidized copper or Japanese copper.

Unless otherwise specified, orders will be filled as follows: copper case lamp will be furnished with an oxidized copper case; steel case lamps will be furnished with a black enamel steel case.

Rope tubular suspension can be furnished for any type of multiple or multiple series lamp furnished. When so ordered can be finished to match lamp finish. Prices and other data on application.

Glassware and Metal Shades

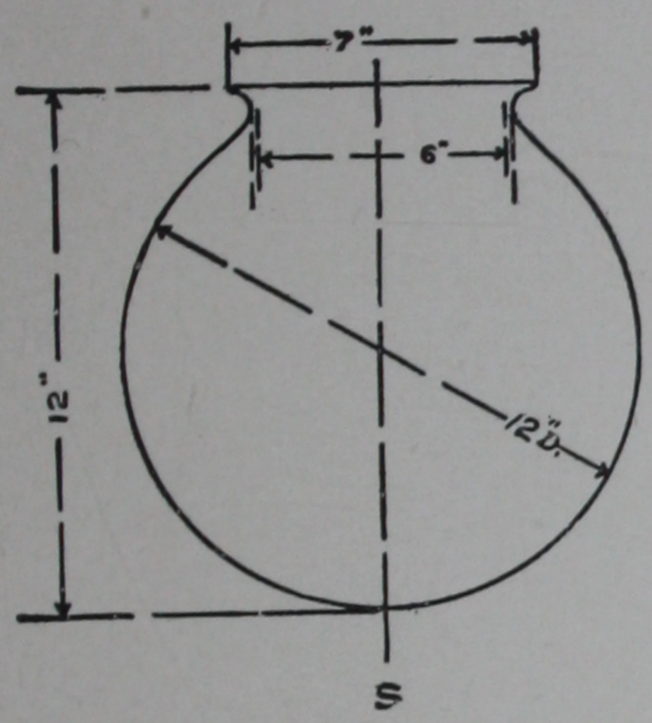


FIGURE 27
Outer Enclosing Globe S

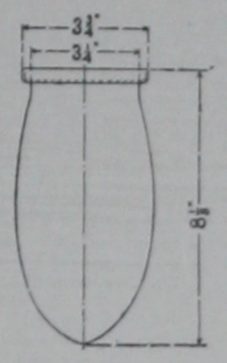


FIGURE 28
Inner Globe R

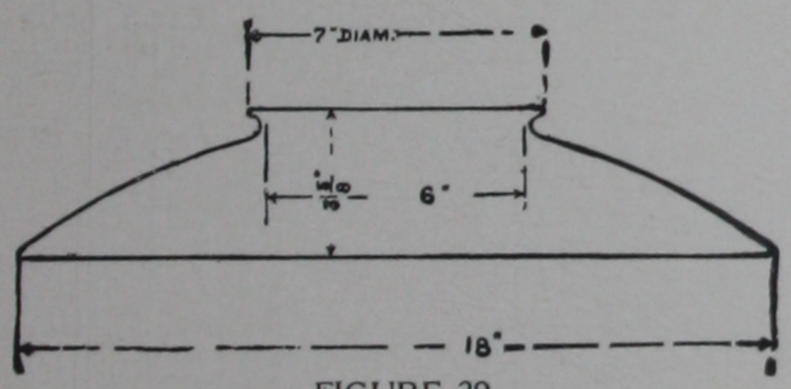


FIGURE 29
Shade M, Opal Glass

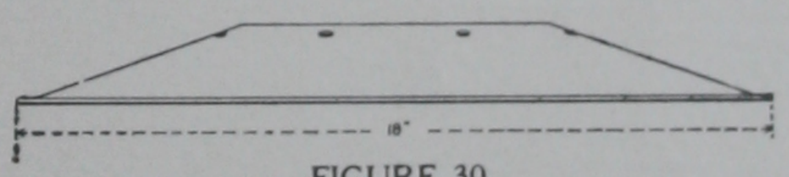


FIGURE 30
No. 1 Metal Shade
Painted with white enamel on inside

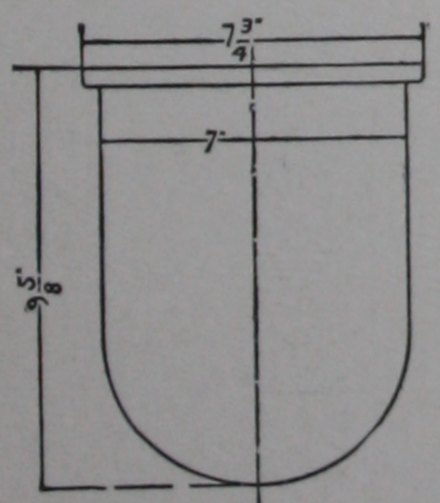


FIGURE 31
Outer Globe T

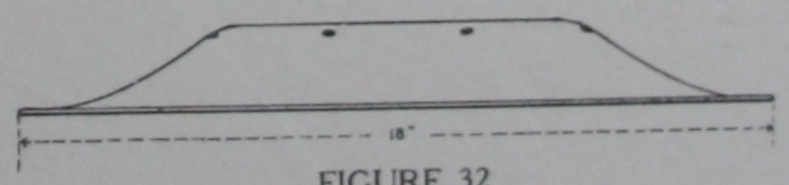


FIGURE 32
No. 2 Metal Shade
Fire enameled on both sides

WESTERN
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Bulletins

A Copy of each of the following Bulletins will be furnished on request.

Number	
5351	Ventilating and Exhaust Fans
3030	Sewing Machine Motors
3056	"E" Type Motors
3060	Hoisting Motors, "H" Design
3065	"I" Type Motors
3070	Motor-Driven Grinders
3075	Alternators
3080	Direct Driven Generators, "L" Design
3085	Belt Driven Generators
3090	Induction Motors
4007	Fan Motors
7030	Multiple Series and Constant Current Arc Lamps for Direct Current Circuits
7035	Multiple and Multiple Series Alternating Current Enclosed Arc Lamps
7036	Series Enclosed Alternating Arc Lighting System
5512	Multiple and Multiple Series Direct Current Enclosed Arc Lamps
9005	Police and Fire Alarm Apparatus



FIGURE 33
Illumination from Type 470 Western Electric Arc Lamps in the plant of the Sauquoit Silk Company, Philadelphia, Pa.

SALES OFFICES

PITTSBURG
CHICAGO
SAINT LOUIS
CINCINNATI
(Standard Electric Company)
NEW YORK
SEATTLE
KANSAS CITY
ATLANTA
SAINT PAUL
(American Electric Company)
PHILADELPHIA
LOS ANGELES
DENVER
SAN FRANCISCO
(California Electrical Works)

MULTIPLE AND MULTIPLE SERIES
DIRECT CURRENT
ENCLOSED ARC LAMPS
BULLETIN NUMBER 5512

621.32

Improved Interchangeable Arc Lamps

7010

August 1902

Western Electric Company

Chicago St. Louis Philadelphia New York

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API INTERNATIONAL

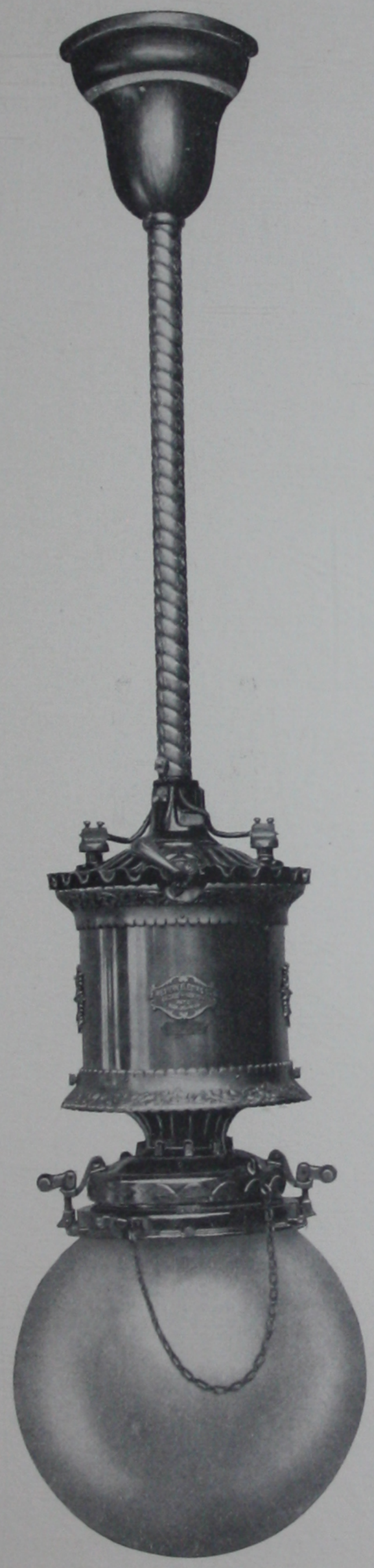
CCA

Western Electric Improved Interchangeable Arc Lamps



WESTERN ELECTRIC COMPANY

Chicago Saint Louis Philadelphia New York





Improved Interchangeable
Long-Burning Arc Lamps for Constant Potential
Direct Current Service

INTRODUCTION

IN THIS catalogue we give full data covering the various numbers and types of our IMPROVED INTERCHANGEABLE ARC LAMPS, designed for direct current constant potential service.

In keeping with the progressive spirit of the age in this field, we have designed a lamp which combines a larger number of good features than any lamp we have before produced.

Our long experience, together with the generous help of our many patrons, has placed us in position to correctly gauge the needed improvements and guard against the evils heretofore encountered.

We have, as far as practicable, held in view the desirability of interchangeable parts, and it will be noted that many parts used in the different types are identical in form and material. This is desirable, both from the user's and maker's standpoint, as it reduces cost, facilitates changing lamps from one type to another, and reduces the time required to obtain repair parts.

Full directions for trimming, installation and care are given with reference to each number and type.

Lamps can be ordered by simply giving number, type and glassware wanted. Adjustment, finish or glassware differing from that given in data sheet for each lamp should be clearly stated.

WESTERN ELECTRIC COMPANY

DESCRIPTIVE

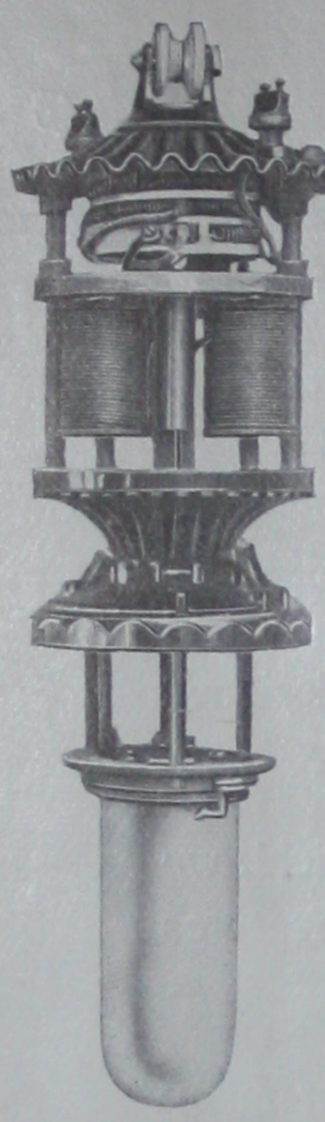


FIG. 1

Fig. 1 and Fig. 2 are views taken from opposite sides of a lamp showing the solenoids with U shaped iron core which regulate the current and voltage of the arc, and actuate the feeding mechanism. This form of regulating electro magnet has been found superior, in many respects, to the single solenoid type so long used.

In Fig. 1 the air dash pot is shown located between and slightly forward of the solenoids. With lamp case removed it is fully open to inspection, and the withdrawal of but two screws permits removal. In the upper part is shown the series resistance, consisting of a helically coiled wire which is supported throughout its entire length by a deep grooved thread upon the surface of a well vitrified porcelain cylinder.

In Fig. 2 can be seen a portion of the square tube forming the guide and shield for the upper carbon connector, also parts of the quick break gravity switch with a special feature securing quick positive action without the use of springs.

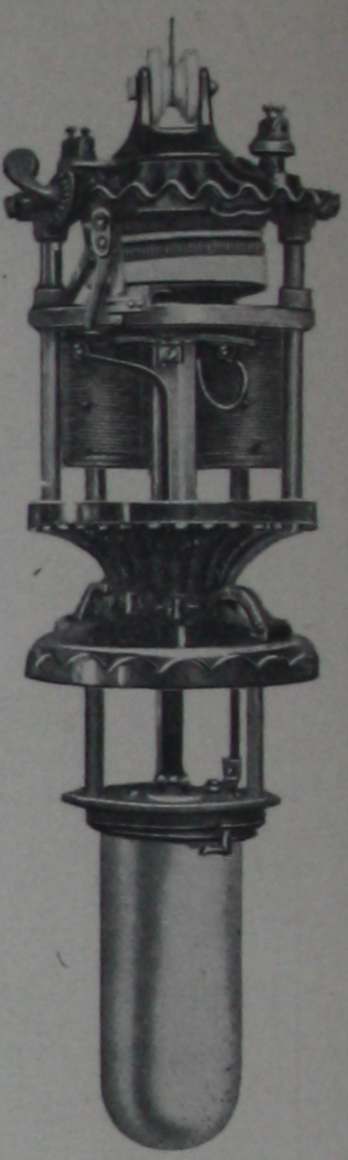


FIG. 2

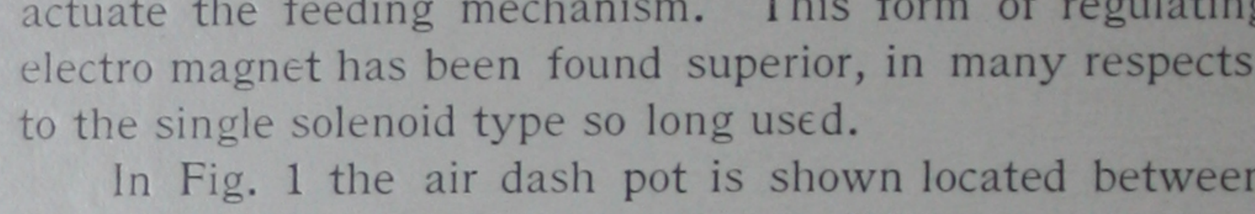


FIG. 3

Fig. 3 is a view of the tubular guide and shield for the upper carbon connector with one side removed showing the sliding or movable carbon connector and the folded copper ribbon forming a metallic connection between the tube and holder. This tubular guide preserves the alignment of the carbons, forms the limiting stop for the downward movement and shields the folded copper ribbon from injury. The tube together with the connector and ribbon can be taken out of a lamp by first removing the gas check plate and then the two screws which hold the tube.

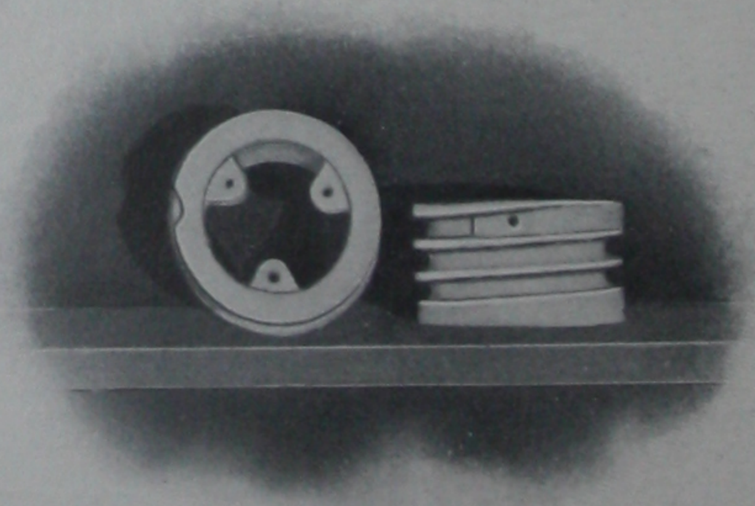
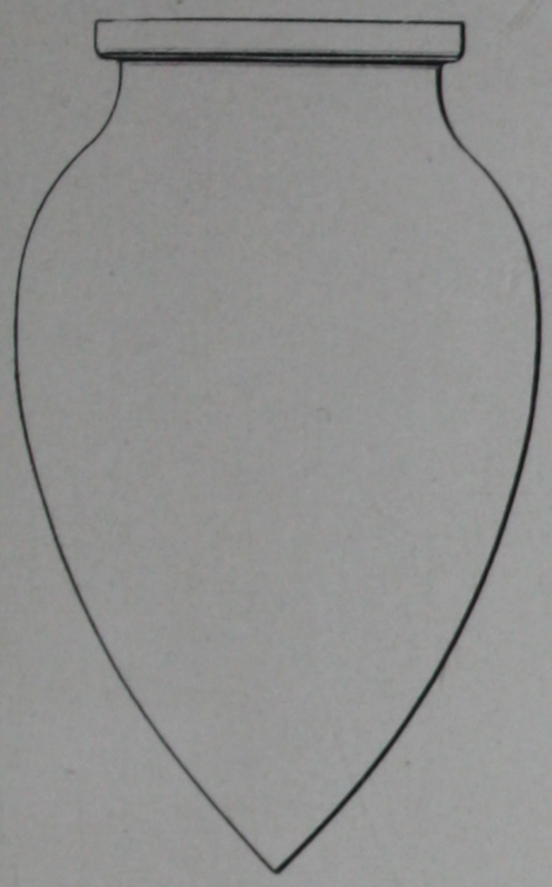


FIG. 4

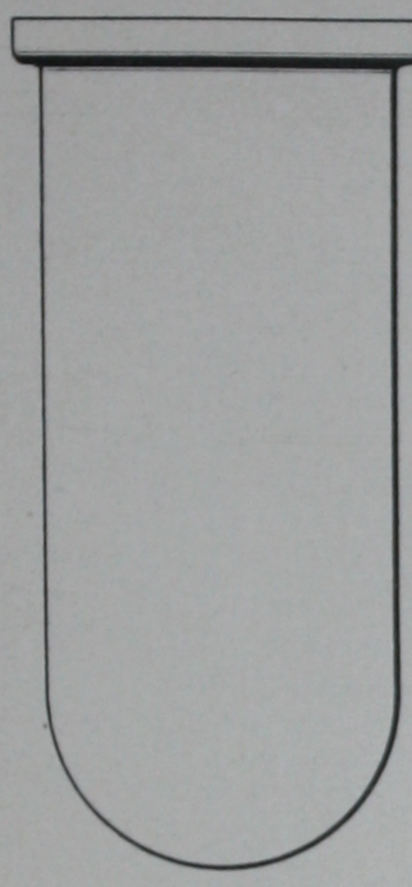
Fig. 4 presents two views of the porcelain cylinder for supporting the resistance coil. It will be seen that the groove for holding the coil is very deep, so that the coil cannot easily be displaced. The opening on the inside of cylinder is also shown with the lugs projecting inwardly for attachment to top of lamp.

STANDARD ENCLOSING GLOBES

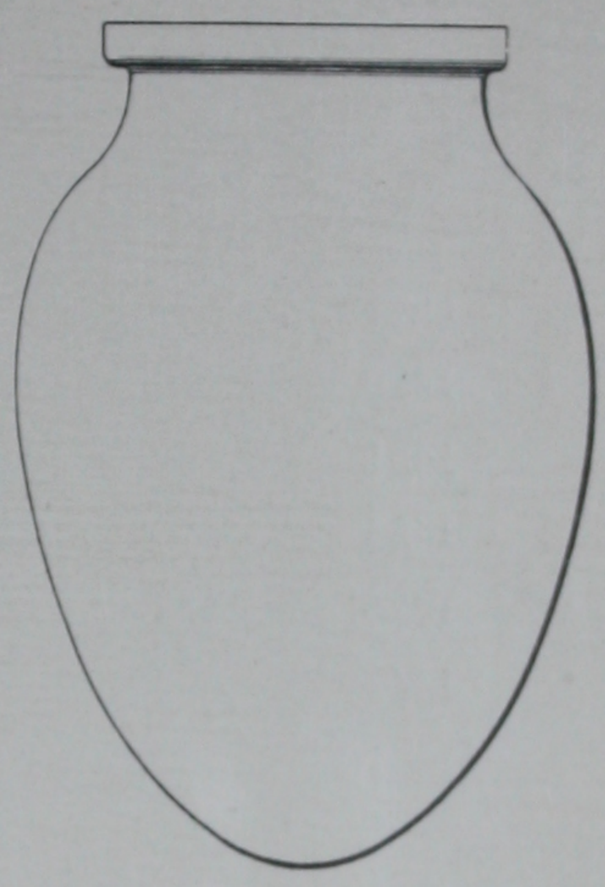
PATENTED NOVEMBER 14, 1899



GLOBE Q



GLOBE L

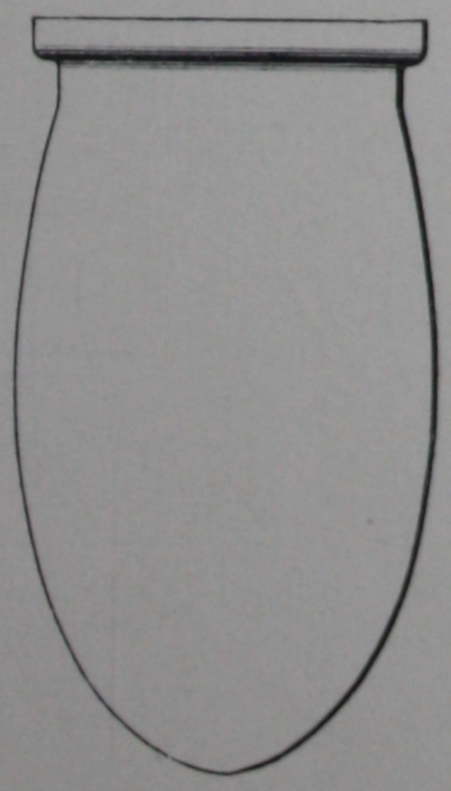


GLOBE P

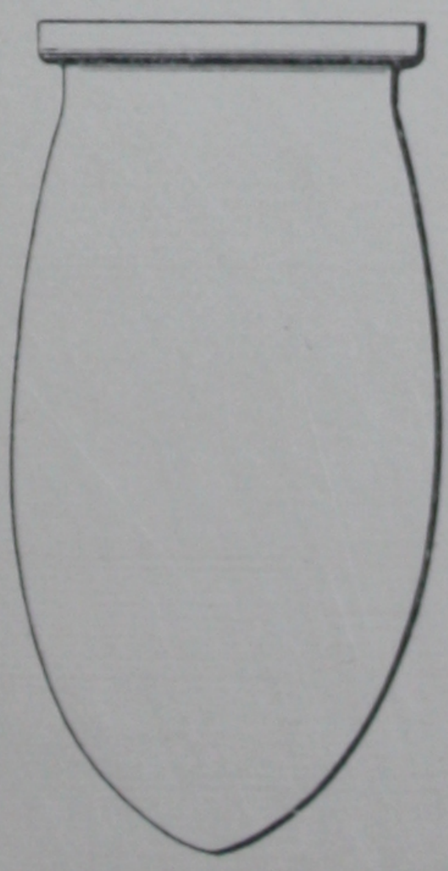
The Western Electric Company's standard enclosing globe, patented November 14, 1899, can be used on all our different types of lamps. Its form removes the glass to considerable distance from the arc and lessens danger of breakage by sudden expansion or contraction.

The globe is held in position by a simple ring which permits easy removal of the globe in trimming and secures a practically air-tight joint between the globe and gas check plate.

NOTE—Globes P, R, W and Q can be supplied in alabaster, redtag or opal glass.
Globe L can be supplied in alabaster, redtag, opal or clear glass.
Globe W can be used on direct current lamps only.



GLOBE W



GLOBE R

Improved Interchangeable Enclosed Arc Lamps

FOR INDOOR USE.

List No.	Type						
1420	470	Singly on	110	Volts	D.	C.	Special Japanese Copper
1421	470	" "	110	"	"	"	Old Copper Finish
1425	475	" "	110	"	"	"	Special Japanese Copper
1426	475	" "	110	"	"	"	Old Copper Finish
1440	490	" "	220	"	"	"	Special Japanese Copper
1441	490	" "	220	"	"	"	Old Copper Finish

FOR FACTORY USE

1428	473	Singly on	110	Volts	D.	C.	Old Copper Finish, Metal Shade					
1448	493	" "	220	"	"	"	"	"	"	"	"	"

FOR OUTDOOR USE

1429	474	Singly on	110	Volts	D.	C.	Old Copper Finish			
1449	494	" "	220	"	"	"	"	"	"	"

FOR INDOOR AND OUTDOOR USE

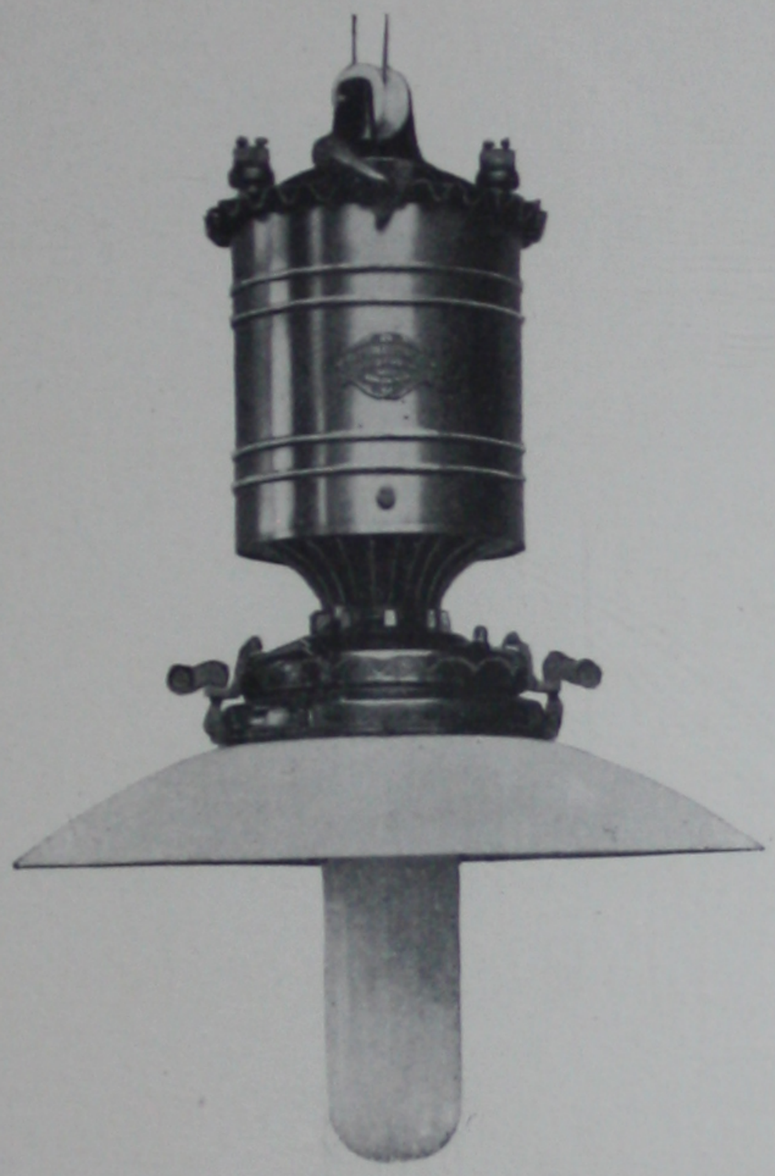
1280	400	Two in Series on	220	Volts	D.	C.	Old Copper Finish				
1285	405	Five " " "	550	"	"	"	"	"	"	"	"

NOTICE

Rope tubular suspension, canopies and ceiling hooks (extra).
Prices on application.

HIGH GRADE APPARATUS

Improved Interchangeable Enclosed Arc Lamp for Constant Potential Direct Current Circuits

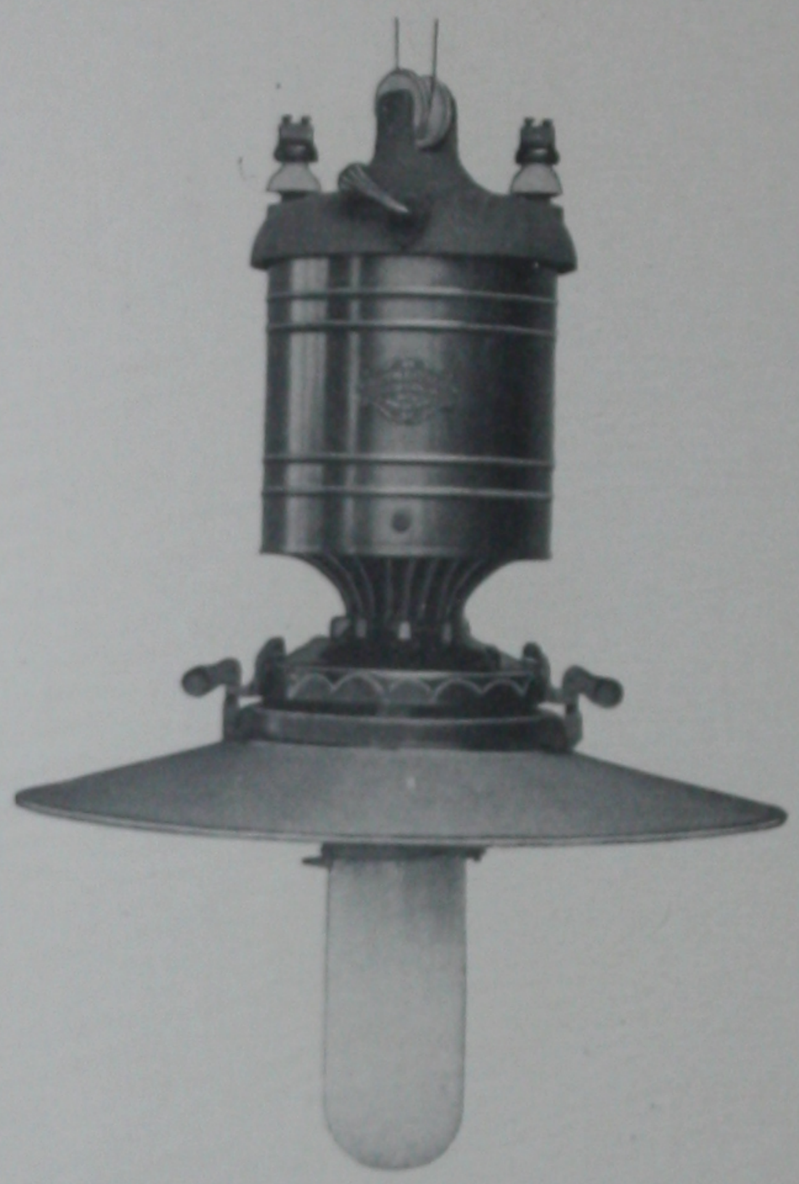


FOR INDOOR USE

Catalogue No.	Type	Amperes	Volts at Arc	Carbons, Length in Inches		Approximate Hours Burning, One Trimming	Length Over All in Inches	Approx. Weight with Globe in lbs.	Style Inner Globe	Style Glass Shade	Finish
				Upper	Lower						
1420	470	5	80	½x12	½x5	150	24½	25	L	M	Special Japanese Copper
1421	470	5	80	½x12	½x5	150	24½	25	L	M	Old Copper
1425	475	3	80	⅜x12	⅜x5	150	24½	25	L	M	Special Japanese Copper
1426	475	3	80	⅜x12	⅜x5	150	24½	25	L	M	Old Copper
1440	490	2½	140	½x12	½x5	150	24½	25	L	M	Special Japanese Copper
1441	490	2½	140	½x12	½x5	150	24½	25	L	M	Old Copper

Globes will be furnished in place of shade M when specially ordered.

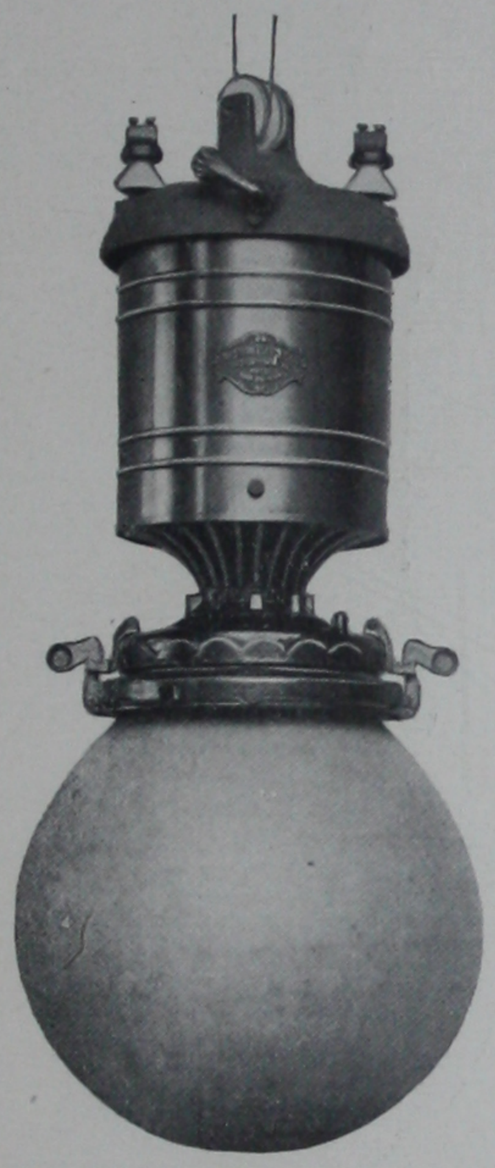
Improved Interchangeable Enclosed Arc Lamp for Constant Potential Direct Current Circuits



FOR FACTORY USE

Catalogue No.	Type	Amperes	Volts at Arc	Carbons, Length in Inches		Approximate Hours Burning, One Trimming	Length Over All in inches	Approx. Weight with Globe in lbs.	Style Inner Globe	Style Shade	Finish
				Upper	Lower						
1428	473	5	80	½x12	½x5	150	24½	23	L	M	Old Copper
1448	493	2½	140	½x12	½x5	150	24½	23	L	M	Old Copper

Improved Interchangeable Enclosed Arc Lamp for Constant Potential Direct Current Circuits

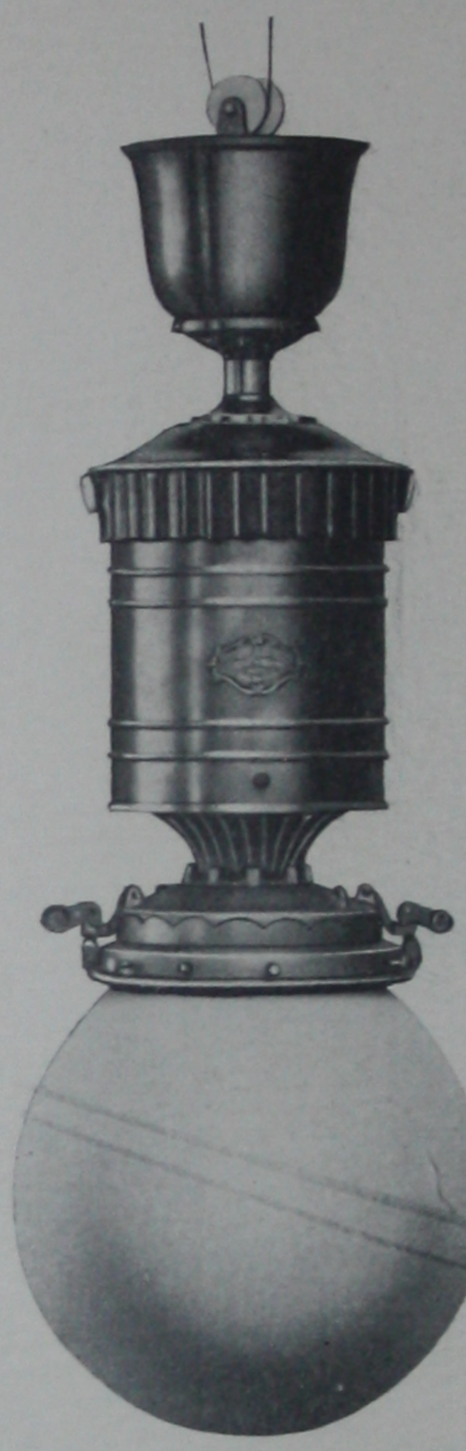


FOR OUTDOOR USE

Catalogue No.	Type	Amperes	Volts at Arc	Carbons, Length in Inches		Approximate Hours Burning, One Trimming	Length Over All in inches	Approx. Weight with Globe in lbs.	Style Outter Globe	Style Inner Globe	Shade	Finish
				Upper	Lower							
1429	474	5	80	½x12	½x5	150	25⅝	26	S	L	M	Old Copper
1449	494	2½	140	½x12	½x5	150	25⅝	26	S	L	M	Old Copper
1427	476	3	80	½x12	½x5	150	25⅝	26	S	L	M	Old Copper

A metal shade, white enamel on under side, will be furnished when specially ordered. Shade is attached directly to outer globe holding ring and permits the use of outer globe.

Improved Interchangeable Series Constant Potential Direct Current Arc Lamps



TYPE 400

FOR INDOOR AND OUTDOOR USE

List No.

1280 For operation two in series on 220 volts direct current. Complete with outer Globe S Clear and standard enclosing Globe L Clear. Old Copper finish.

For outdoor use the canopy should be inverted, thus forming a weatherproof bell.

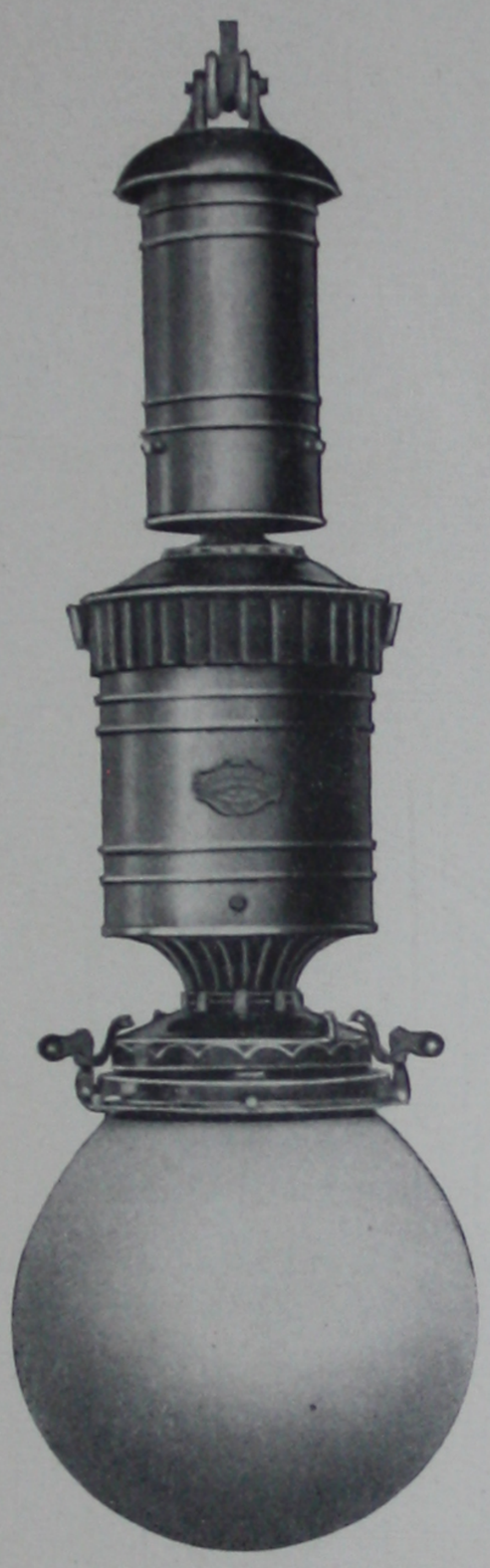
When the carbons in one lamp are consumed both lamps will be extinguished by the automatic cut-out.

NOTE: When specially ordered, these lamps can be adjusted to operate at any specified voltage between 200 and 250.

DATA

Catalogue No.	Type	Amperes	Volts at Arc	Carbons, Length in Inches		Hours Burning, One Trimming	Length Over All in inches	Approx. Weight with Globe in lbs.	Style Inner Globe	Style Outer Globe	Finish
				Upper	Lower						
1280	400	5	80	½x12	½x5	150	32	32	L	S	Old Copper

Improved Interchangeable Series Constant Potential Direct Current Arc Lamp.



TYPE 405

FOR INDOOR AND OUTDOOR USE

List No.

1285 For operation five in series on 550 volts direct current. Complete with outer globe S Clear and standard enclosing Globe L Clear. Old Copper finish.

This lamp is especially designed for street railway circuits being provided with an automatic cut-out and substitutional resistance.

The lamp is cut out automatically when the carbons are consumed, while the remaining lamps of the series are not interfered with.

NOTE: These lamps can be operated any number in series provided proper voltage is maintained.

DATA

Catalogue No.	Type	Amperes	Volts at Arc	Carbons, Length in Inches		Hours Burning, One Trimming	Length Over All in inches	Approx Weight with Globe in lbs.	Style Inner Globe	Style Outer Globe	Finish
				Upper	Lower						
1285	405	5	80	½x12	½x5	150	36	35	L	S	Old Copper

Marine Direct Current Enclosed Arc Lamp.

Type 450

List No.

1400 For burning singly on 110 volts, with special case and wire guard, with inner and outer globe for marine service, indoor and outdoor use. Complete with outer clear globe T. with standard inner Clear globe L and wire guard. Old Copper finish.



DIRECT CURRENT STYLE

Catalogue No.	Type	Amperes	Volts at Arc	Carbons, Length in Inches		Hours Burning, One Trimming	Length Over All in inches	Approx. Weight with Globe in lbs.	Style Inner Globe	Style Outer Globe	Finish
				Upper	Lower						
1400	450	5	80	½x12	½x5	130 to 150	23½	28½	L	T	Old Copper

Directions for Trimming

Remove the enclosing globe by turning the spring holding ring to the left until the lugs on the ring are clear of the supporting hooks, then lowering the globe carefully.

After removing the stubs from the holders, place a ½″ x 12″ solid carbon in position, passing it up through the lower clamp, the gas check plate and clutch into the upper clamp where it can be secured by a moderate pressure from the clamp screw tightened by the fingers. Next place the lower carbon in position, observing that its upper end is on a level with the small brass marking band upon one of the side rods.

In replacing the enclosing globe be very careful not to strike it against the lamp, particularly the upper ground edge; even a small nick in the glass will greatly decrease the life of the carbon.

See that the globe is held against the gas check plate by the spring ring with moderate pressure. It will be noticed that the ring is bent on each side to cause it to lift the globe at two opposite points, and should it be found that a globe does not rest against the plate or only lightly, the pressure can be adjusted by increasing the bend a little in each side of the spring. Be careful not to give excessive pressure as the globe is liable to be broken thereby.

It is well to gauge all carbons used, seeing that none are used for uppers exceeding .52″ or smaller than .505″ in diameter. Carbons larger than the limit can be broken and used for lowers.

The above directions will apply to all types herein mentioned except No. 1425 T 475 and No. 1426 T 475 in which types ⅜″ x 12″ carbons are used.

After a lamp has burned its full time there will remain sufficient of the upper carbon to make a lower in retrimming.

In cleaning globes do not use any article of metal; use the hand or a piece of wood to move the waste inside the globe.

An occasional washing in good soapy water, with a thorough rinsing in clear water will remove the dirt and leave the globe clean as when new.

Figs. 8 and 9 show a device for trimming a lamp when hot. The ends of the spanner are brought in engagement with the projecting lugs on the globe holding ring as shown in Fig. 8. It is then moved into a horizontal position and turned to the left to remove the globe, see Fig. 9.

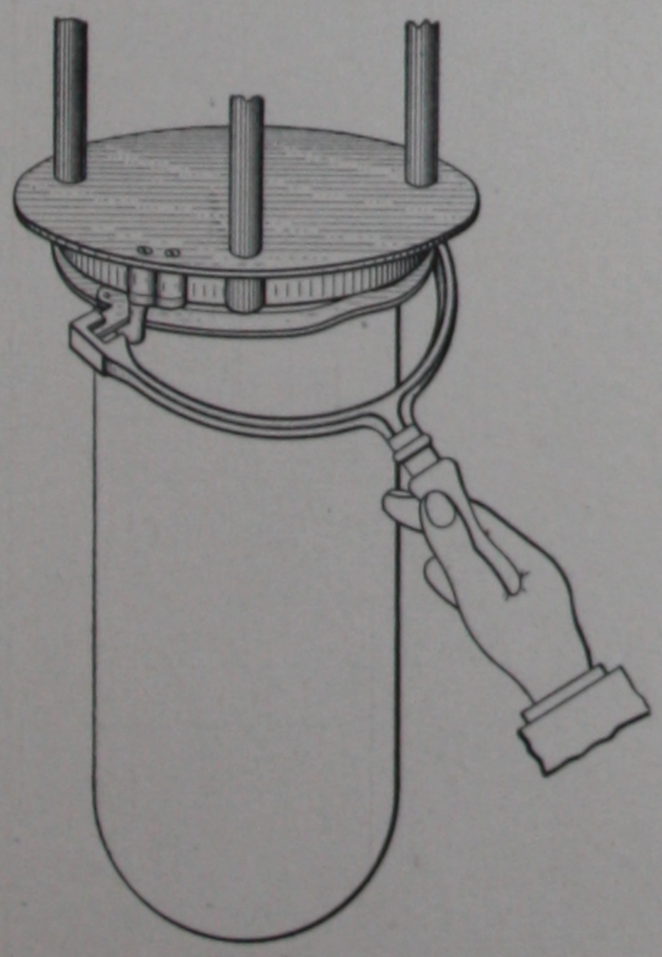


FIG 8



FIG 9

INSTALLATION

In installing these lamps the requirements of the National Board of Fire Underwriters call for a fuse to be placed in series with each individual lamp. This fuse should be of such capacity that a rise of 100% in current above normal will cause it to blow immediately.

A ready means of ascertaining whether a fuse is of proper size is to remove the case from a lamp, then, while it is burning, press the core of the regulating solenoids downward until the upper carbon is released by the clutch and rests upon the lower so as to extinguish the arc. The fuse should be blown the instant the arc is extinguished.

In case a fuse should be blown at any time, always examine the lamp well before restoring the fuse, and do not under any circumstances allow excessively large fuse wire to be used.

Lamps No. 1420, 1421, 1425, 1426, 1428 and 1429 are ordinarily adjusted for 110 volts and will admit of a range in voltage from 100 to 120, the voltage at the arc varying almost exactly as the terminal voltage, the current remaining practically constant.

Lamps No. 1440, 1441, 1448 and 1449 are ordinarily adjusted for 220 volts and will admit of a range from 210 to 230 volts, the voltage at the arc varying with the terminal voltage, leaving the current practically constant,

When lamps are to be operated permanently on higher or lower voltage than that given, it is well to state the voltage in ordering so that the lamps can have special adjustment. This adjustment is given by cutting in or out resistance wire accordingly as the voltage is high or low until the desired arc voltage is secured.

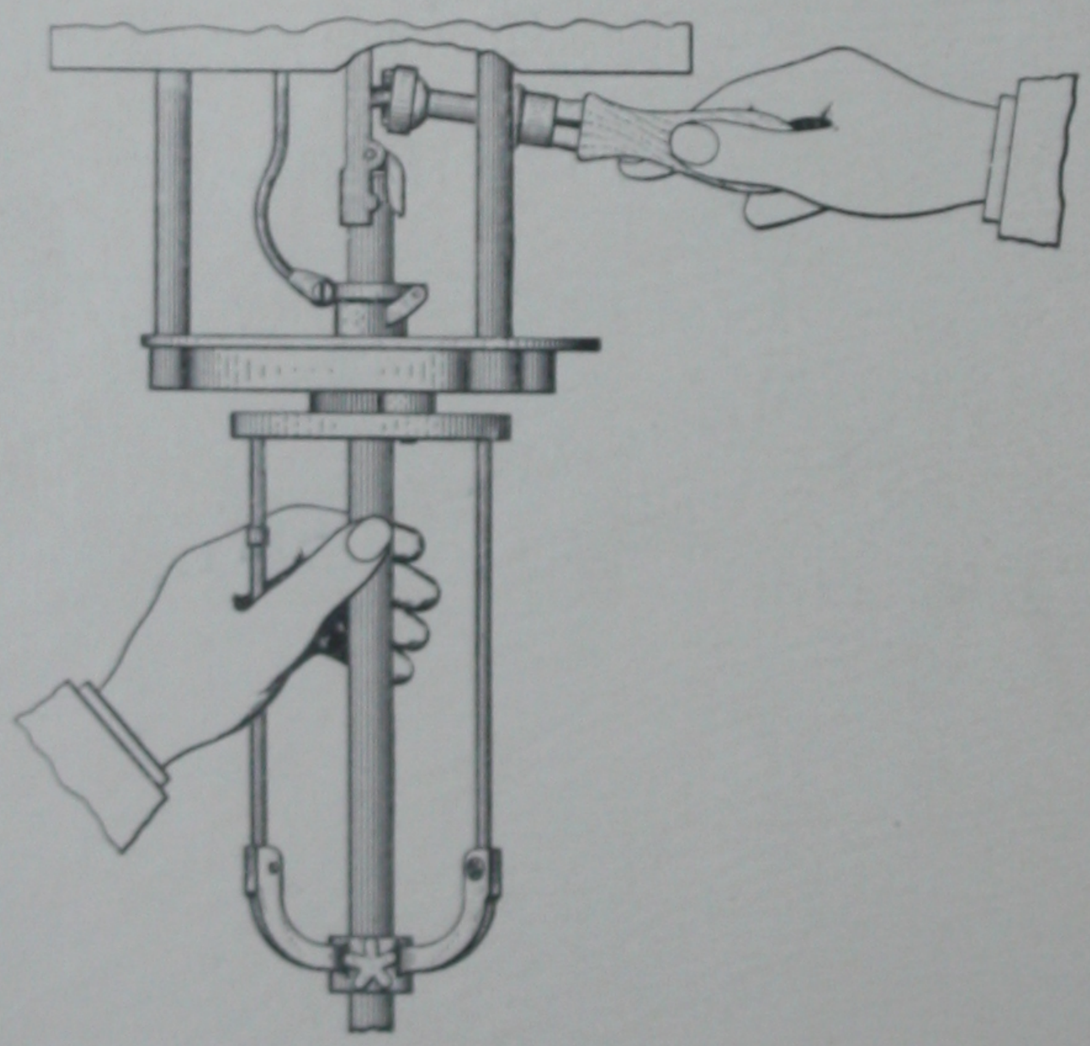


FIG. 10

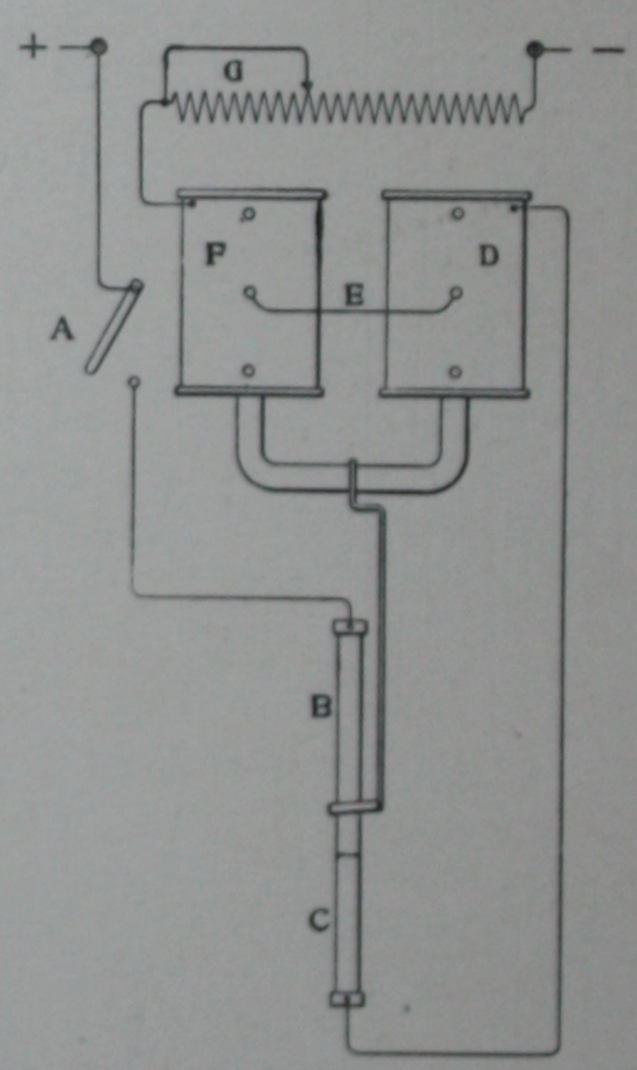


FIG. 11

Fig. 10 shows a socket wrench used for trimming a lamp when hot. Do not use much force in tightening screw.

Fig. 11 is a diagram of connections of the following types: 470, 473, 474, 475, 490, 493, 494. The marks + and — refer to terminals of the lamp. Always connect a lamp in such a way that current will pass from + to — through the lamp, or downward through the carbons.

In the diagram A is the switch for turning lamp on and off, B and C the carbons, E the adjustable connection between the solenoids, F and D the solenoids, and G the adjustable resistance showing the shunt wire used in regulating the amount of resistance.

INSTALLATION

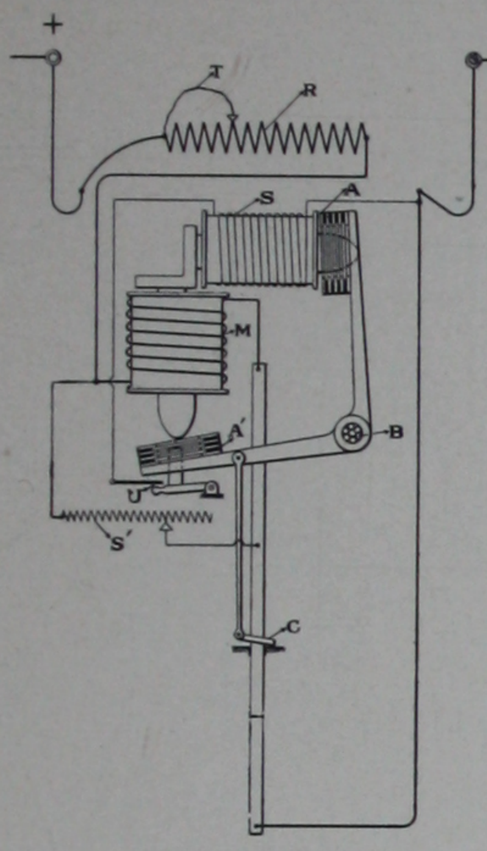


FIG. 12

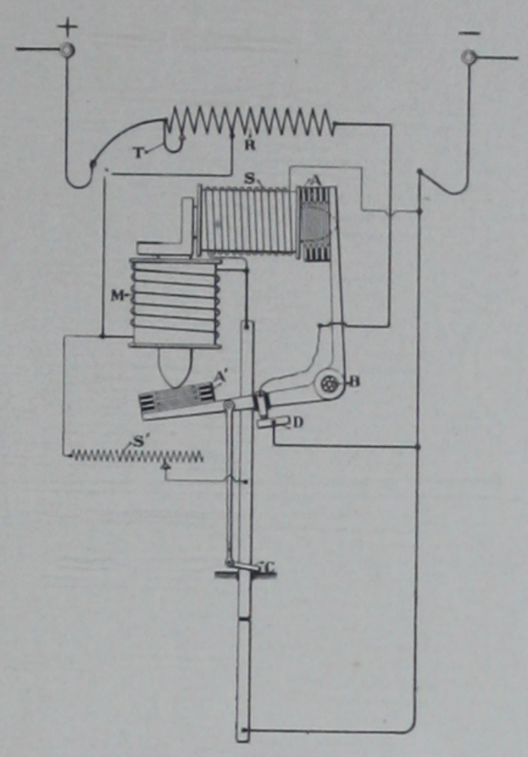


FIG. 13

Fig. 12 is a diagram of connections of type 400.

This lamp should always be so connected that the current will pass through the lamp from the + terminal to the — terminal, or downwards through the carbons. M is the main or series magnet, S the shunt or feed magnet, A A′ the armatures, B the roller bearing for the armature lever, C the clutch, U the shunt magnet cut-out, R the balancing resistance, S the resistance shunt around the main magnet, and T the adjustable shunt cord for regulating the amount of resistance. Adjustment of the lamp for different currents is secured by moving the sliding clamp upon resistance S′ so as to vary the amount of current shunted round the magnet. Adjustment of the lamp to a particular voltage is secured by moving the cord T until arc voltage and current are as desired.

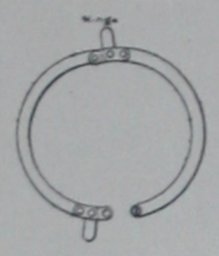
Fig. 13 is a diagram of connections of type 405.

Always connect so that current will pass through lamp from + to — terminal or downward through the carbons.

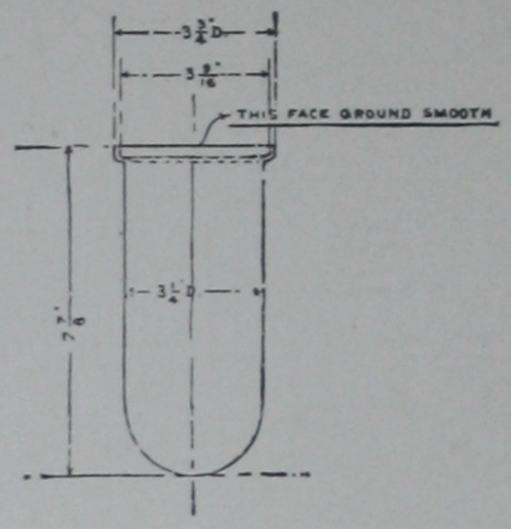
The connections of this lamp are the same as in type 400 except that this lamp has an automatic cut-out, D, which operates to cut in a substitutional resistance which takes the place of the arc whenever a lamp is cut out and allows the other lamps of a series to burn uninterrupted, and there is no shunt magnet cut-out. A portion of the resistance R is used as a balancing resistance and can be varied to suit conditions by means of the shunt cord T.

As in type 400, adjustment for current is obtained by shifting the movable clamp in resistance shunt S′.

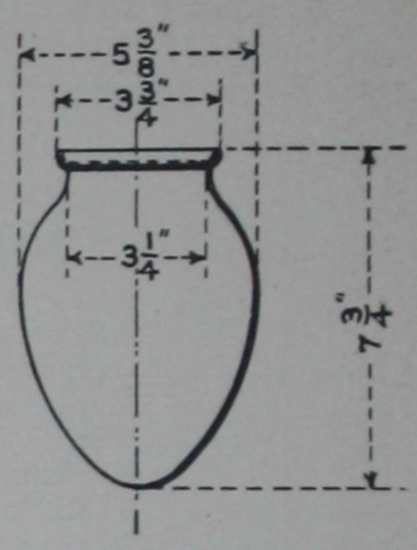
TYPE AND DIMENSIONS OF ARC LAMP, GLOBES AND SHADES



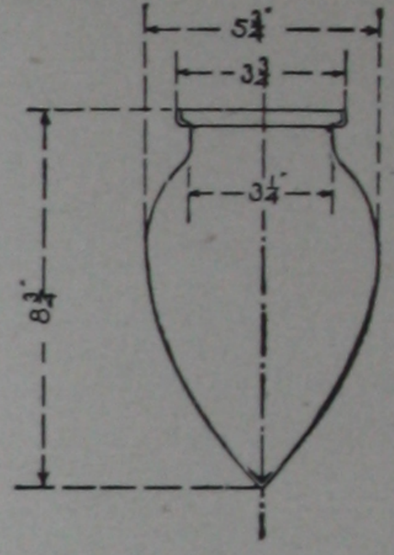
INNER GLOBE SUPPORTING RING FOR L, P AND Q GLOBES



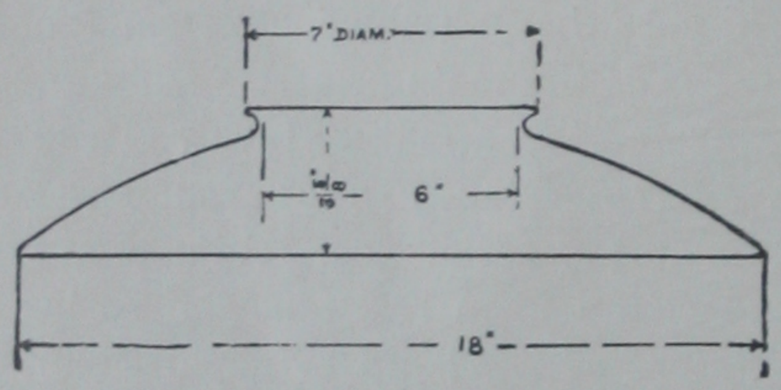
GLOBE L



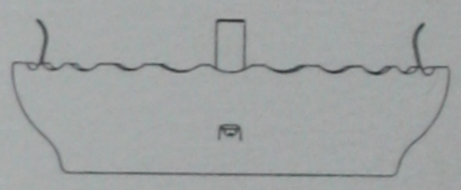
GLOBE P



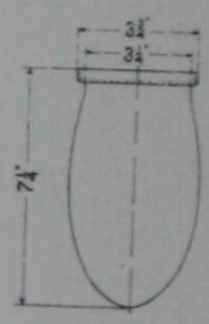
GLOBE Q



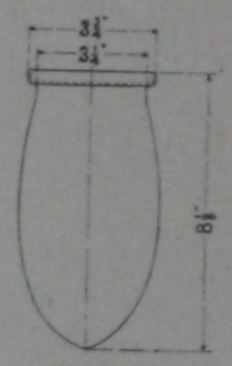
PORCELIAN SHADE M



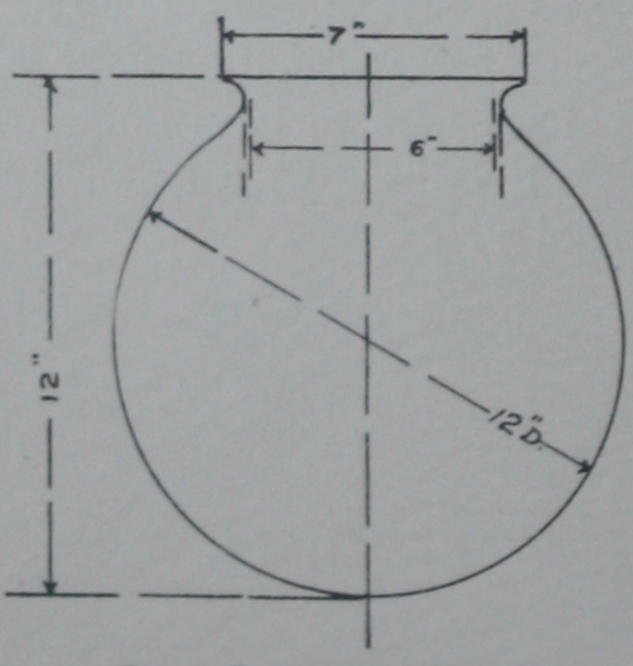
RING FOR M SHADE



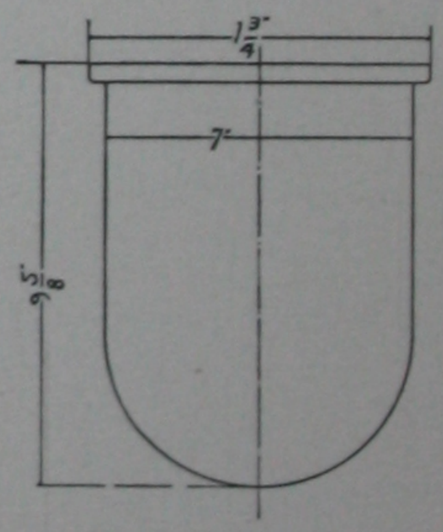
GLOBE W



GLOBE R



OUTER ENCLOSING GLOBE S



DIMENSIONS AND DIAGRAM OF OUTER GLOBE T

WESTERN ELECTRIC COMPANY

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Belt Driven Generators	*No. 2004*
Power Motor Catalogue	*No. 3002*
Power and Lighting—Slow Speed Dynamos and Motors . .	*No. 3004*
Petite Alternating Current Arc Lamps	*No. 7004*
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